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VIEWS, NEWS AND INTERVIEWS.

A recent largely attended electrical meeting in Chicago, called to consider matters of great importance to those present, was honored by the sudden *entree* of a self-important gentleman to their deliberations in the midst of spontaneous applause intended for the speaker then holding forth. This was received by the visitor as a tribute to himself, to which he responded with many bows. The assemblage, alive to the situation, and seeing the humor of the affair, increased its demonstrations with the result that the recipient nearly doubled himself in his profuse acknowledgments. He, perhaps, is not aware to-day that he was but an incident.

In some sections of England coal is selling at $15 per ton with prospects of the price going higher.

It is reported that a State telephone will soon be established in Finland. It is under contemplation to connect the towns of Abo and Viborg, and the preliminary work has already been commenced. The line, which will prove of considerable military importance, will follow the coast, and it will be built for account of the State. The cost is expected to be some 100,000 Finnish marks.

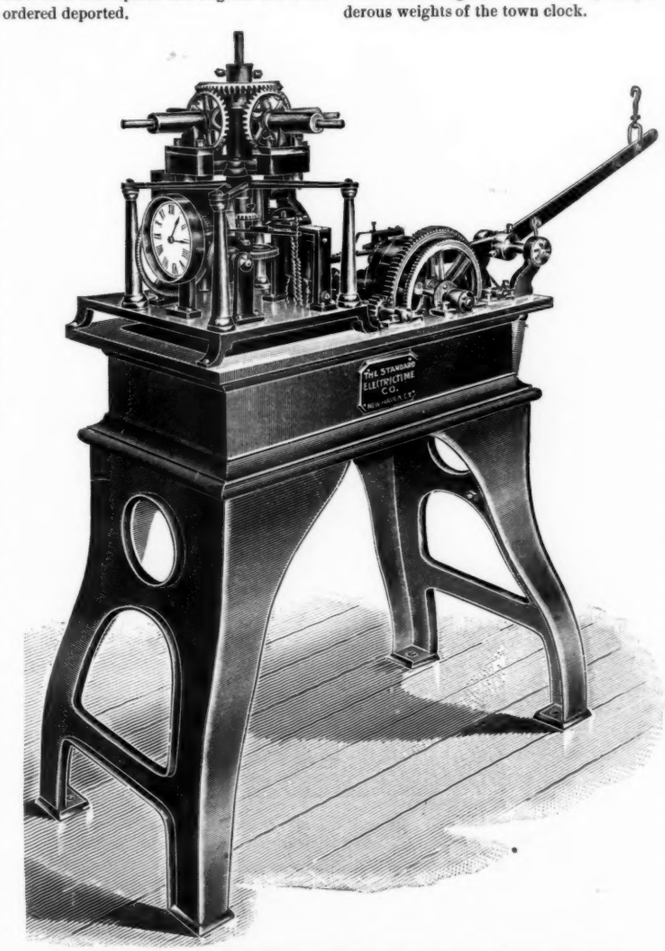
Engine No. 225 of the Pennsylvania's new class P, with 78 inch wheels, did some fine running a few days ago, having reached the speed of 90 miles per hour, and averaged over 87 miles per hour for several miles. It also ran 65.2 miles (including six slow-ups) in 62.75 minutes, and from a standstill at Bay View it ran to Chases, 11.4 miles, in 9 minutes and 39 seconds.

R. R. Dobell, a wealthy Quebec capitalist and president of the Canadian Atlantic Cable Company, has just returned from England, where he received an offer for laying the company's cable from a point at the Straits of Belle Isle to a point on the west coast of Ireland. Mr. Dobell says that the capital required is $2,500,000, of which $500,000 has been paid in. A meeting of the Canadian directors will be held in a few days to consider the offer. An effort will be made to induce the Dominion Parliament in the coming session to grant a subsidy toward establishing direct cable connection between Canada and Great Britain. It is believed that the British Government also will assist the enterprise, which will form a link in the cable communication England expects to secure with Australia over British cables and British territory.

Acting Superintendent Pugh, of the Immigration Bureau, on November 4, detained James Ingram, an Englishman, from landing at Boston. Ingram represented himself as a cable and telegraph operator, and showed a letter written by Joseph B. Beard secretary of the Central and South American Telegraph Company, of New York, offering him a position at $90 per month for a term of three years if he came to this country. This was construed by the commissioner of immigration at Boston as a contract, and therefore a violation of the immigration law. This view was upheld and Ingram has been ordered deported.

A Striking Tower Clock Operated by Electric Motors.

The electric motor has been made to perform a great variety of work formerly done by manual labor. Not only has it taken the place of horses for propelling street cars, and the small engine for driving machinery, but it is even in use in the church for furnishing wind for the organ, and to wind up the ponderous weights of the town clock.



STANDARD ELECTRIC TIME COMPANY'S STRIKING TOWER CLOCK OPERATED BY ELECTRIC MOTORS.

Our London contemporary, *Lightning*, reproduces in its reading columns the striking advertisement of the "Maggie Murphy" lamp recently inserted in the ELECTRICAL REVIEW by the Pennsylvania Electric Engineering Company, and comments on it by saying that we may soon expect the "Ta-ra-ra-boom-de-ay" accumulator and the switch "That Broke the Bank at Monte Carlo."

Among the recent uses, however, is that made by the Standard Electric Time Company, of New Haven, Conn., in operating their tower clocks mentioned in the ELECTRICAL REVIEW a short time since. The clock then described operated only the hands, but called forth the necessity for something to operate the striking apparatus for tolling off the hours of night, which has now been brought out by this company in the form of a complete striking tower clock, a cut of which is shown herewith.

Two electric motors are used to operate this clock. The motor used for driving the hands is connected by a gear and worm to an upright shaft, on the top of which is the usual gearing for the dial works. The motor circuit is closed every minute by a pair of magnets connected to a fine self-winding regulator, and after making the required number of revolutions to move the hands through a space of one minute on the dials, breaks its own circuit and there rests until the regulator closes the circuit on the next minute.

A larger size motor is used to operate the striking mechanism, and its size varies according to the weight of hammer to be used. In this case the circuit is closed once an hour, and after striking the required number of blows breaks its own circuit, where it rests until the circuit is again closed.

Some realization of the labor saved by this arrangement may be gained when it is understood that in the ordinary tower clock operating four pairs of 6 foot pointers, and striking the hours on a 1,000 pound bell, requires from 1,500 to 2,000 pounds of weight that must be wound up every eight days, besides the regulating necessary to keep it correct, which, owing to the extremes of temperature, makes accurate time impossible.

One of the most important features of this arrangement is the use of the ordinary open circuit batteries for operating the motors. The motors are so wound that but a small amount of current is used, and they will last from one to two years without removing the elements, which consist of only sal ammoniac and zinc; and only 10 cells are required for operating the hands of four 6-foot dials. The number used for operating the striking mechanism varies according to the weight of the hammer used. The speed of these motors is very low, the efficiency high, and so arranged that they will always start even with a dead load.

By dispensing with the ponderous weights used in the ordinary clock, the weight in the tower is greatly reduced. The electric tower clock complete, as shown, will weigh about 400 pounds, while a weight clock suitable for similar work will weigh from 1,500 to 1,800 pounds, exclusive of weights. Another advantage also of this arrangement is the fact that secondary dials may be operated throughout the building from the same regulator, which being placed in some office in the building where the temperature is comparatively the same, will keep much better time than a clock that is placed in the tower and exposed to the great extremes of temperature. Both the time and striking machinery is very simple; being operated directly by gears, it is not liable to become disarranged in any way.

The company is now placing one of these clocks in the tower of the Waterbury Clock Company's new building at Waterbury, Conn.

The Evolution of the Fixture Art and Decorative Illumination.

READ BEFORE THE ASSOCIATION OF EDISON ILLUMINATING COMPANY, AT NEW YORK, AUGUST 12, 1891.

BY LUTHER STIERINGER.

The widespread introduction of the incandescent electric light has not, up to the present time, developed all the features or applications to which it is adaptable, as a flexible means of artificial illumination, nor has it shown a reproduction of all the effects produced by gas, oil and candles. Unquestionably it has a greater scope than these. It has already disclosed capabilities for many original adaptations beyond the sphere of any other light.

ANCIENT PORTABLE OIL LAMP.—THE DOVE SENT FORTH BY NOAH.

SIGNALS OF FIRE.

In the opinion of many savants, fire and language are coupled as the twin characteristics common to humanity everywhere.

ANCIENT OIL LAMP FROM THE MUSEUM AT NAPLES.—THE EARLIEST OF THE FOOT-LIGHTS.

Almost as far back as the dawn of human history light was recognized as a favorite means of expressing ideas. It involved the expenditure of but little energy and was practically instantaneous in its transmission of intelligence between distant points. The signal fires which from the hilltops of ancient times gave notice of the movements of an enemy, or conveyed to the watchers other information of equal importance, varied in size from the torch to what might be termed a small conflagration, and, by numberless shades and modifications, conveyed ideas equally diverse.

From the days of Job, the prince of the rock-bound city of Petra (a city lost to civilized knowledge for thousands of years), whose career is recorded in the oldest of the books of sacred history, the fire of the lightning flash was recognized as a signal of anger from an offended Deity.

The Jewish prophet Jeremiah, 588 years before the Christian era, proclaimed: "O, ye children of Benjamin, gather yourselves to flee out of the midst of Jerusalem, and blow the trumpet in Tekoa, and set up a *sign of fire* in Bethhacceren; for evil appeareth out of the North, and great destruction."

It is written that while the Israelites wandered in the desert for 40 years, a pillar of fire went before them as their guide by night when they traveled, and rested upon the Tabernacle when they camped.

Homer compares the lambent flame which shone around the head of Achilles to the signals made in besieged cities by clouds of smoke in the daytime, and by bright fires at night, as certain signals calling on the neighboring states for assistance.

Julius Africanus minutely describes a mode of spelling words by a telegraph of fire signals.

In Brumoi's account of the "Theatres of the Greeks" it is stated that fire signals were used to communicate the events of wars and to direct the commencement of battles. This description of signals was even anterior to the use of trumpets. A priest, crowned with laurels, preceded the army, and held a lighted torch in his hand. He was respected and spared by the enemy, even in the heat of battle. Hence the old proverbial expression for a complete defeat, that *even the very torch-bearer had not been spared*.

Hence, also, it seems highly probable that the usage arose of representing discord with inflamed torches.

The Chinese, like the ancient Scythians, communicated intelligence by lighting fires. Polybius gives the general appellation of "Pyrsia" to the signals then used, indicating that *fires* formed the principal means.

Agamemnon signalled by beacon fires to his distant queen the news of the fall of Troy, 1,084 years before the Christian era.

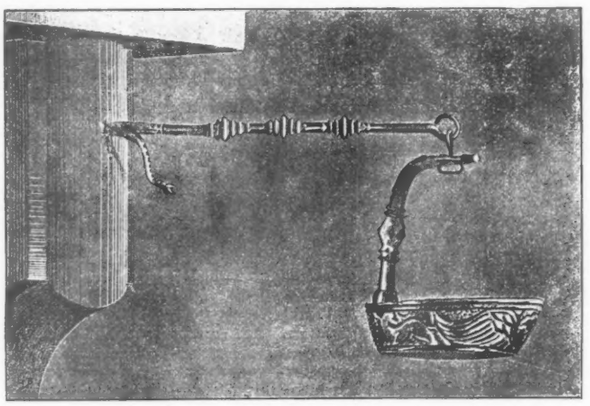
THE EARLY SUBDIVISION OF LIGHT.

It is singular that this primordial invention (artificial illumination), which is one of the expressions of the superiority of man over all nature, and distinguishes him even in his lowest estate from the animal, has been one of the last to attain perfection.

The French of Reguier tells the story in a charming manner, of which the following is a free translation:

"Hundreds and hundreds of times I have taken the lantern in my hand,
Seeking at full mid-day among the human race
A man who was a man in fact and in look,
And who could stand the test of the virtues.
There is no corner or nook that I have not tried
Since nature placed me here below;
But the more I am frayed and the more I am polished,
I believe in my own mind all the world is in its dotage."

The triumphal march of conquerors and the nuptial festivities of kings and princes have for many centuries been considered incomplete unless this universally useful aid lent its enlivening influence to grace the occasion. From the thousands of torches which gave the ruddy glare to light the Roman general's return to his native city, to the bursting rockets, whirling wheels and ever-changing designs in colored light, which are so common to gala occasions in our own time, man's type has been taken and his lesson learned from the midnight sky; number, mass, diffusion marking the advancement from the bonfire of the savage to the pyrotechnic displays of the most civilized nations of this age of progress.



EARLY FORM OF BRACKET OIL LAMP.—FORGED AND ORNAMENTED IRON.

TORCHES AND OIL LAMPS.

This principle (the sub-division of light), so universal in all forms of exterior illumination, was early copied and applied to interior spaces. The huge fire-places of the olden days, which were depended upon as much for light as heat, were supplemented and then supplanted by supports upon which torches were arranged about an apartment to be lighted. These in turn gave way to the smoking oil lamp, but even among the most civilized nations of antiquity, the Greeks and Romans, this mode of lighting existed in almost as barbarous a form as among the savage tribes. The suspended bronze lamp or the candelabra in carved bronze of the time of the Roman emperors was not much pleasanter or less smoky than the torch of resinous wood with which the first known men lighted their abodes—those men whom history ignores, and whom geology has, during the last 50 years, resuscitated. Of this Roman order were probably the lamp which, according to the ancient Jewish rites, was kept perpetually burning, and in Solomon's temple at Jerusalem the seven golden candlesticks or standing lamp supports, one of the earliest recorded structures by which lights were grouped for decorative effect, formed at once (though composed of these same oil lamps) an object of beauty and religious symbol.

THE ADVENT OF CANDLES.

It was only at the end of the twelfth century that the great novelty of a light-giving solid material to replace oil, the tallow candle made of sheep's fat, was known in England. Its original form has been handed down to the present day, but its use was at first very limited, and it was only in the time of Charles V that the French adopted it in the mansions of the wealthy. To our forefathers it seemed a great step in advance—and for their epoch they were right—and they were long contented with it. There were no other luminaries to light the glories of Versailles, and the plays of Moliere, of Racine, and even of Voltaire, were produced by the light of candles, six to the pound.

Candles in the corners of windows long guided the traveler through the streets of cities. Lanterns for public lighting date from the middle of the seventeenth century only, and not until 100 years later were they surmounted by a reflector to prevent the sky from receiving a large portion of their light.

The discovery of the composition of fatty bodies by Chevreul, in 1811, made it possible to extract from tallow the best of its light-giving elements, stearic acid. He took out a French patent for his process, which, however, was not commercially successful. Other French chemists succeeded, in 1825, in manufacturing stearine candles, and in 1831 two young physicians, MM. de Milly and Matard, sold the first of the "star candles," which soon became famous throughout the world.

THE SEVEN GOLDEN CANDLESTICKS OF THE ANCIENT JEWISH TABERNACLE.

Thus, seven centuries have passed since this means of lighting was first introduced, and yet to-day the candle is the standard of illumination.

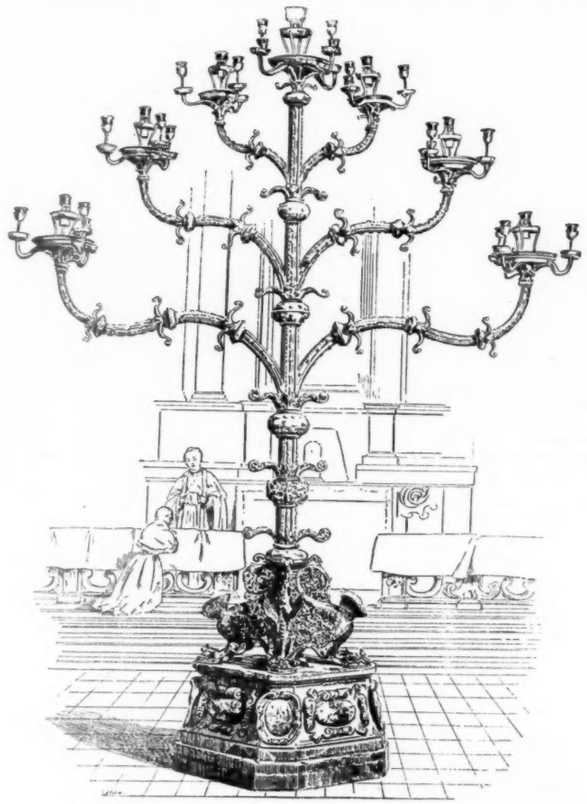
EARLY MODE OF MANUFACTURING CANDLES.

THE ERA OF SUSPENDED FIXTURES.

The development of methods of suspension for sources of artificial light has been a deeply interesting one, and this more especially because confined to a comparatively recent period of the new civilization which has so rapidly progressed since the dawn following the Dark Ages.

Oil and Chain Fixtures.—The earliest form of a suspended light was that known in religious rites as the "Sanctuary Lamp," usually a cup or basin, pendant from chains, and containing oil or fat and a floating wick. The mediæval types were usually arranged with reference to three points of support, and to-day it is a travesty on sacred tradition to make a "Sanctuary Lamp" in any other way than of a basin, supported by three chains meeting above it. More elaborate forms of such lamps have had subsidiary arms carrying small or accessory sources of light.

Illumination proper should be considered as having always been accomplished from centers pendant. In this we would, of course, include brackets, or candlesticks, which are structural in character, and could not be regarded as portions of a comprehensive system. In these suspended centers, there was no requirement for the supply of energy outside of the fixture itself, the material employed in the production of light being furnished by special service at proper intervals. The



Bronze Candelabra at the Cathedral of Milan.

earliest fixture showing a departure from three chains converging to the ceiling, or merging into a single chain, is a rod acting as a support for the converging points. In the early history of the art, iron rods were

Bronze Sanctuary Lamp Illustrative of the Earliest Form of Suspended Light. — Church of Sta. Maria del Popolo, Rome.

not made sufficiently long to make shafts in one piece, and hence chain was the more common form.

Candelabras.—Later on, in the time of Louis XVI. these primitive pendants developed into candelabras, built with solid iron shafts, rigid at the base, with arms diverging equi distant, so as to divide or equipoise the weight. Such a structure was suspended with a hook, eye or other device, leaving it free to move, the shaft generally being a skeleton or tube surrounding the solid rod. In neither of these cases was it essential to transmit or convey anything to the point of light.

This period extended down to the advent of gas, and until that time the art of making tubes was not sufficiently developed to allow of any departure from this construction. It has only been within a few years that lap-welded tubes could be depended on. The first pipe of this character was manufactured at Reading, Pa., as recently as 1846. Mr. C. Hennis, who took an active part in the electric work at the New Orleans Exposition, was employed as their superintendent.

Chandeliers.—It was some years after the introduction of gas before pipes could be used as skeletons of the modern gas fixture. Cornelius is considered as the father of the candelabra in this country, he having introduced multitudes of forms from 1835 to 1840, and he should also be credited with having developed the modern gas fixture. Here, instead of supporting the light-giving material, he was obliged to introduce into the fixture, channels for conveying the medium from outside sources. The first of this class was usually made of brass pipe, combined with castings, cored, or made in halves or sections, and given the necessary distributing chambers and channels. These semi-cylindrical sections were brazed together by lips or edges, which were afterwards removed.

The development of the tube has always been a special and separate art, involving particular information and experience in metallurgy and manipulation.

In former years a distributing chamber at the base of the circular stem was considered indispensable to the chandelier. It is still maintained in Europe, but has for years been entirely omitted in this country.

In early practice, no "fittings" were used, as we now understand the term, but only saddles of cast brass, with the outlets brazed on. This practice in gas fitting survived at as late a date as 1850, and specimens are now in existence. There was no standard thread, these saddles being bored and the threads cut upon them in any manner which happened to be devised by the particular workman, in accordance with his individual ideas.

This was also about the time that the solid die, which admitted of standard threads, came into use.

The threads were made formerly entirely by the old split dies, and this method of making the thread, with no standard, was carefully preserved as a matter of business policy so as to prevent repairs to a fixture by any other than the manufacturer.

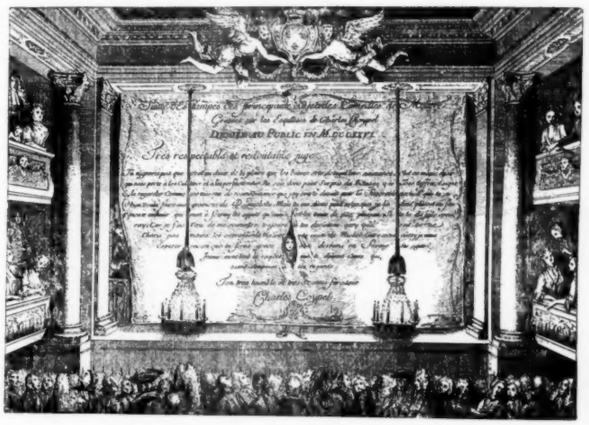
Solid dies did not come into permanent use until within very recent years.

(To be continued.)

TELEPHONE CHAT.

On Tuesday, October 31, 1893, marked the completion of the telephone circuit between Butte and Missoula. The new line is a complete metallic circuit. It represents an investment of $50,000 and is one of the leading enterprises put through in Montana this year.

The Erie Telegraph and Telephone Company will pay a quarterly dividend of one per cent. by check mailed to stockholders November 20, 1893, that are of record at noon, Saturday, November 11. The stock books were closed at noon, November 11, and will be opened Monday, November 20, 1893.



Theatre Lighting by Candles About 1787.

The bureau of the American republics has been informed of the completion of changes in the telephone system of the City of Mexico, with a view of ridding the streets of the insecure net-work of telephone wires. This has been done under the direction of Mr. J. E. Torbett, formerly engaged in telephone work in Charleston, S. C., and Atlanta, Ga. The new system consists of grooved cables on which the wires are placed. Iron poles have been substituted for the wooden ones, which were regarded as unsafe. The system extends to a number of suburban towns and also to important points in the interior, such as Guadalajara, Puebla, Oaxaca, Vera Cruz, Queretaro, Zacatecas, San Luis Potosi, Monterey and Saltillo.

Galileo's Bronze Chandelier.—Cathedral at Pisa, Italy.

Among the suspended chandeliers of the XVI century, it is interesting to recall that famous lamp of the Dome of Pisa which gave rise to one of the most beautiful discoveries of modern ages. It is not only a work of art, but it is also celebrated in the history of the sciences. If tradition is to be believed, t was while looking at it that Galileo conceived the first idea of the pendulum. The learned Buet thus related the anecdote:

"About 1563, Galileo, at the age of 18 or 20 years, being one day in the metropolitan church of Pisa, noticed the regular and periodic movements of a lamp suspended at the top of the dome, and proved it by repeated experiments. He immediately understood what use could be made of this phenomenon for the exact measurement of time, and this idea never went out of his memory; he made use of it in 1568 for the construction of a clock designed for astronomical observations."

Breguet System of Calling Device for Telegraphic and Telephonic Purposes.

It is a matter of general knowledge that frequently managers of telephone and telegraph companies are debarred from constructing new, or extending old, lines because the expense of constructing such additional lines is in no proportion to their earning capacity. A great many inventors have lately exerted their ingenuity to provide means for allaying or overcoming this drawback, and the most natural expedient has been to employ devices which enable several subscribers to be served by a single main line. This is also Mr. Breguet's fundamental idea. Each sub-station has a device, consisting of a kind of pointer telegraph, annunciator and the usual telephone outfit. The model, shown in Fig. 2, is adapted to serve

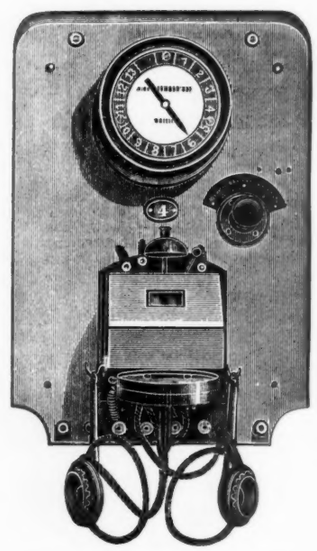


FIG. 1.—BREGUET CALLING DEVICE.

13 sub stations, and the dial shows a number of sections, numbered from 1 to 13, besides one marked "busy" and another "unoccupied." In its resting position the pointer stands on the last mentioned section. If a station desires to call No. 1, it is sufficient to press contact button M once. This action advances the pointer at each sub-station to the section marked No. 1, while the calling devices of the remaining stations are cut out of circuit, except that at the calling station. By means of the contact key the circuit is closed repeatedly until the pointer reaches the "busy" section. At that moment both the calling and called stations are connected for inter-communication, all other stations though being in a derived circuit to the main line, cannot interfere.

The action of pressing M permits C to contact with *m*, thus closing battery P, one pole of which, T, is earthed. The circuit now being closed, relay R at the calling station becomes operative and the current passes from 1 to 1. At all other stations C remains on *m*, and the latter is connected to T and R. Consequently at all stations armature *a* is attracted, closing the local battery circuit P at *c*. This action excites the electro-magnet E, whose armature carries a detent, as clearly delineated in Fig. 2. In other words, each attraction of the armature moves the pointer one section. It will be seen that the toothed wheel, or ratchet I, in addition to the pointer, bears a metal pin *g*, which is placed at such a point that at a given position of the pointer it is enabled to contact with an elastic spring 1, closing the circuit of the calling battery P2. The call bell at the called station continues to ring until stopped by the subscriber, while the bell at the calling station gives one stroke for each closing of the contact at *g*. P3 is the microphone battery. Although this is a simple circuit arrangement for telephonic purposes, Mr. Breguet's system becomes somewhat involved when adapted for telegraphic work.

The World's Fair Reviewed.

The Chicago *Tribune*, of November 1, devotes more than a dozen pages to a review of the work of the World's Fair. Included therein is a series of letters or essays from the different officials of the Exposition, wherein each individual has crystallized the thought uppermost in his mind regarding the effect of the Exposition on the people and on the country. Prof. J. P. Barrett refers to the work of the Department of Electricity in the following terms:

I wish to comply with your request for a parting thought on the results attained in this department of the Exposition. I wish to do so primarily because it is your request, as I recognize the fact that the newspapers of Chicago have been the most powerful forces at work in behalf of the Fair. No other combined influence, or, indeed, all others, have done so much to bring about whatever success has been achieved. They have been, as it were, guiding and protecting genii, or, like an approving or protecting conscience, they have held up our hands when we were right and in a spirit of friendship have reproved us when their judgment was against us. While we may differ from the judgment passed by the Chicago papers many times, we have never impugned their motives, nor respected them the less because of those differences.

Speaking of the department, I desire to say that we have accomplished the highest aim which the well-posted man could have set. We have not been the instrument for bringing out any great new principle, like the arc or incandescent light, telephone or dynamo. It seems that this is not an epoch of radical inventions. What we have done, though, is to demonstrate beyond question the commercial applicability of electricity in lines not heretofore mastered. The incandescent plant in service at the Fair is not alone the most extensive but the most economical—to the contractor—and the most efficient ever constructed, leaving out of consideration the perfection attained in decoration. Its chief merit, of course, apart from careful mechanical construction of the machinery, lies in the fact that it employs what is known as the alternating system of transmission, which means to the financier a saving of immense sums in copper and the further possibility of lighting territory at long distances from the source of supply of power.

One of the most powerful strides in electricity is in the adoption at the Fair for the first time very large units in machines and in their operation by what is known as the multiphase system of transmission. These large machines, especially those doing away with shafting and belting, by being directly coupled to their engines, open really a new epoch in the direction of economy and

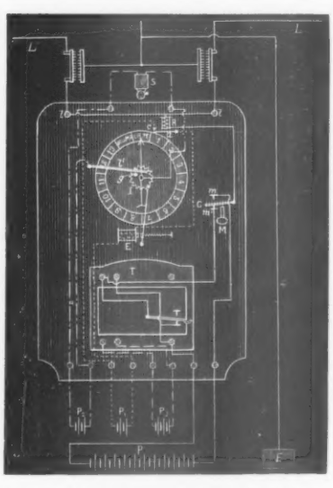


FIG. 2.—CONNECTIONS OF BREGUET CALLING DEVICE FOR 13 STATIONS.

efficiency. Saving in friction, saving in the expenses of operation, and saving in the first cost are among the advantages. Nearly all the large companies are going into this class of machine construction, and business competition will do the rest for perfection and progress.

Motors for power service have been demonstrated in greater variety than ever before. Beginning with the operation of the sawmills used in the period of construction, and ending with the tiny motors operated by exhibitors in an infinite variety of ways, we have some of the possibilities of the future.

The electric launches have demonstrated that this class of service is cheaper than by any other power. These boats have earned more money with less outlay in cost and maintenance than would have been possible with steam or any other power. Moreover, they are cleanly, rapid, and in every way enjoyable.

Cooking by electricity and its application for domestic purposes is also henceforth commercial if it had not been before. It may not be uninteresting to the public to know that electric cooking and other domestic applications of the current have been commercial for a good while and that the lack of success hitherto in these directions has been due almost entirely to fights over patents.

I think these few words will indicate a train of thought for the intelligent reader to follow as an indication of the ends intended to be reached by me in the organization and execution of the work for this department.

Prof. Barrett's staff are thus referred to in the same issue of the *Tribune:*

Prof. Barrett's first assistant in the department, Dr. J. Allan Hornsby, has been in the work from its inception, having been appointed secretary of the department on the day that Prof. Barrett's commission was approved by the directors. Mr. Hornsby has done the actual work of the department under Prof. Barrett's direction, consulting with the chief on all matters at all times. Prof. Barrett's position as City Electrician has made it impossible for him to give all his time to the work, hence the necessity to have a man with him in whom he had perfect confidence. Mr. John W. Blaisdell, General Superintendent, is best known before the foot-lights, having been on the stage for some years and having become famous in theatrical work with the best actors of the day. He was for some years manager of Hooley's Theatre, and was with the best companies at all times. Mr. Blaisdell has had the thankless task of passing upon applications for passes for those in business with the department.

Mr. W. W. Primm, engineer for the department, is a West Point man, and has been the brains of more than one large engineering project for which some famous engineer got the credit. He has been with Professor Barrett for nearly two years, and is in no small degree to be credited with the success of the department. Willis Hawley, one of the assistants, came to the department from the active management of a large station at Urbana, Ohio. He is an expert in every branch of the business, having secured his early training in the factory of the Western Electric Company, of Chicago. He can do anything from winding an armature to building a station from his own designs. George J. Henry is an inspector of electrical service. Largely to his efforts is due the magnificent fire protection of the building, which has in it concentrated power enough to burn a hole in Lake Michigan. Mr. Henry is also an expert amateur photographer, and has been taking the photographs for Professor Barrett's report to the Director-General.

Orlando Shepard came to the department as Mr. Henry's co-laborer in the inspection department from one of Prof. Barrett's city lighting plants. Frank J. Sullivan and Stacey Butler are two young men through whose hands have passed every piece of apparatus that goes to make the electrical exhibit. They have kept all the records of the receipts of goods, and have delivered every piece, not one case having been lost. They have relieved each other for night duty, one or the other being in service during the whole twenty-four hours of every day since the Fair opened. Last, but by no means of least importance in the department, is the stenographer, George E. Moore. When the work of the office became too severe to be done by two young ladies, Mr. Moore was employed in their stead.

In closing, it may be stated that Prof. Barrett's men have been paid salaries, as a rule, in excess of those paid in any other department. He has insisted on the best men he could find, and has likewise insisted that they be paid for their services. One of the secret's of Prof. Barrett's success as an executive lies in the fact that every man in the department has specific duties to perform, and is held to a strict personal account for their proper and prompt execution.

Another Lamp Suit.

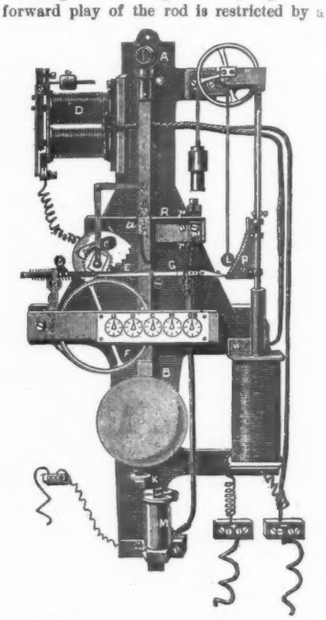
Judge Colt, of the United States Circuit Court, at Boston on November 4, listened to a motion for an injunction made by the Edison Electric Light Company against the Davis Electrical Works. The Edison people claim that the Davis establishment, which is located in Springfield, has been infringing the Edison incandescent lamp patents. Messrs. Fish, Richardson and Storm appeared for the Edison Company, and John L. S. Roberts for the defendant. Judge Colt reserved his decision.

A New Electricity Meter.

Dr. Batault, a Parisian established at Geneva, has invented a new electricity meter possessing some features of novelty. It is shown in the accompanying illustration, which, together with the following particulars, is taken from our London namesake.

Essentially, it consists of an ingenious adaptation of Hipps's electric pendulum. The armature K, at the lower end of the pendulum, is periodically attracted by magnet M, as it is energized by current for a moment sent into it through a make-and-break A, R, *r*, *r*. This pendulum is thus kept swinging constantly at the same frequency.

The pendulum works a ratchet C, which turns an eccentric E; this eccentric works a sliding rod back against a spring. The forward play of the rod is restricted by a



A NEW ELECTRICITY METER.

wedge P, fixed on the core of a solenoid carrying the consumer's current; this core is counterbalanced by weights, as shown in the figure, one weight acting with constant force over a pulley, the other acting as a pendulum L.

The magnet D, with contact-breaker H, makes the circuit of magnet M, on switching in the first lamp, and breaks the circuit on switching off the last lamp, thus starting the pendulum and stopping the pendulum so that no energy is consumed when no lamps are burning.

The action of the meter is obviously simple; when no current passes, or only one lamp is on, the wedge P keeps the sliding rod back out of contact from the eccentric, so that it only moves through a very small distance during the short time it is in contact with the eccentric. As more current is passed the wedge moves down through a distance proportional to the increased current, and thus allows of a greater excursion of the sliding rod, the excursions of the sliding rod moves the first large wheel of the index train by a rachet, as clearly shown in the figure, and thus counts up the distance traveled by the rod—a distance proportional to the current passed.

The pendulum weight L is adjusted to cause the core of the main solenoid carrying the wedge to move proportional to the current approximately.

The connections between the electric supply (+) (—) and the various contacts and coils can be clearly seen.

The mechanical arrangement of the parts displays considerable skill of a high order; the whole mechanism is carried on one solid rigid foundation plate of metal, forming a good stiff back-bone; the parts once adjusted will remain so, independent of changes of temperature and atmospheric influences and vibrations.

This is a simpler meter than any of the other clock-work forms, and requires no winding up; and it is evident that any ammeter could be substituted for the solenoid and core, provided the wedge moves with the variations in current.

The Western Electric Company's Luminous Sign at the World's Fair.

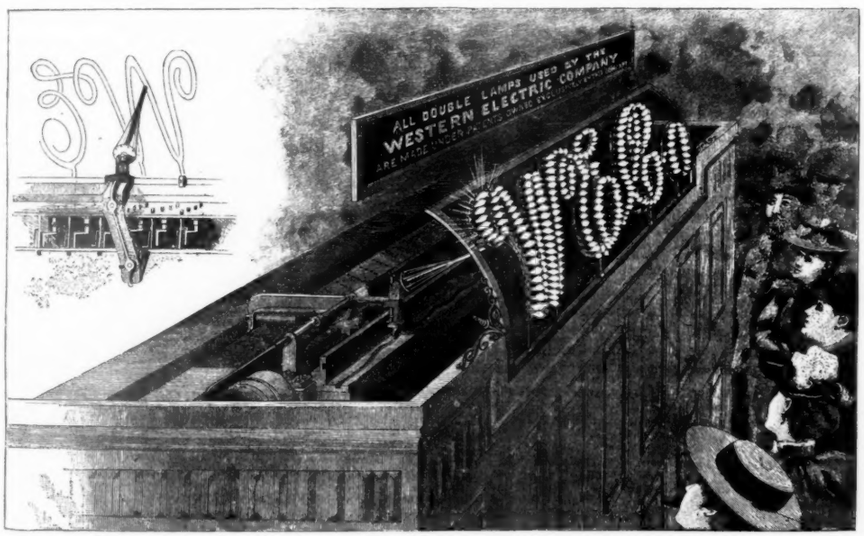
One of the exhibits of the Western Electric Company, at the Columbian Exposition, received a great deal of attention from the general public. This exhibit, while in the line of what theatrical people call "business," was really remarkable in its ingenuity and construction, and answered the purpose of attracting the popular mind. It appeared like a veritable writing on the wall. It consisted of a series of lamps arranged as shown, to give the initials of the company's name in script outline. These lamps apparently are lighted and extinguished by means of a wand that moves mysteriously along the path of the letters at their rear, and which, although it does not touch the lamps, seems to exercise some magic influence and causes them to break out into a brilliant glow. It moves forward on its journey, writing on the air the letters W. E. Co., and as it moves along the lamps become illuminated. When it has reached the end of its journey and lighted all the lamps in the series, the wand begins deliberately to move back in the reverse direction but in the same path, and extinguishes each lamp as its point passes by. The movement of the wand is automatic and the precision of its movement renders it fascinating to watch. As a matter of fact, the only part that the wand has to play in this little comedy is that of heightening the illusion. It really has no function to perform beyond bewildering the uninitiated. The real secret of operation of the apparatus is not understood until the beholder has abandoned this idea and has grasped the fact that each lamp is connected with the operating table or switch board, separately. Then all becomes comparatively clear, and he will be ready to have explained to him the details of operation which are rendered comparatively simple by having exposed to his view the internal mechanism, as appears in our illustration, which is from the *Scientific American*, to which we are also indebted for many of these particulars.

The wand or pointer is mounted on a slide rest or carriage, so that as the slide rest is traversed by a feed screw back and forth from right to left and left to right the pointer is automatically moved, so that its end, by a species of pantagraph mechanism, follows exactly the outlines of the letters. Its motion in doing this is controlled by two sinuous grooves in planes lying at right angles to each other. These planes, with their grooves, are seen below the base of the pointer. Each groove receives a projecting piece, which, as it moves, actuates the pointer.

The travel of the wand is effected by a feed screw exactly as a slide rest in a lathe is worked. On the rod supporting part of the weight of the carriage, with its switch-shifting rollers and pointer, are two collars, one at each end, which, when struck by the carriage, shift the belt so as to reverse the feed. Thus as long as the machinery operates, the pointer moves back and forth, from right to left, and reversing from left to right, along the line of the letters, the pantagraph attachment causing it to follow their outline exactly.

Behind the apparatus is a double switch board, whose surface above and below is traversed by two rollers. Spring jack pins, operating vertically, actuate a series of switches, one for each lamp, and turn the lamps on and off, one at a time. Two rollers, set one slightly in advance of the other and pressing against the upper and lower surface of the double switch board operate the spring jack pins. As the pointer moves to the right, the roller underneath, which is in the rear of the upper one, as referred to the direction of travel, presses up the spring jack pins, closes the contacts, and lights the lamps one by one. The pins are so placed with relation to the mechanism that as the pointer points to a lamp, it is lighted or extinguished. When the end letter O is reached, the belt-shifting mechanism comes into play, the rotation of the feed screw is reversed, and the carriage begins to come back. As it does this, it will be seen that the upper roller becomes the rear one. It presses down, one by one, the spring jack pins, opens the contacts, and extinguishes the lamps, each lamp being extinguished as the pointer points to it. The effect of this is that the pointer seems to write and obliterate the name in its travel, and as the pointer is visible to the audience, many wise conjectures are made as to its operation, induction and all sorts of mysterious powers being invoked to account for the mystery.

The larger figure of the cut shows the general disposition of the apparatus, while the arrangement of the spring jack pins pushed up and down by one or the other roller, throwing the lamps in and out of action, is shown in section in the smaller figure. The pins are arranged diagonally, so as to secure the pushing up or down of them in systematic progression.



THE WESTERN ELECTRIC COMPANY'S LUMINOUS SIGN AT THE WORLD'S FAIR.

Insulated Pliers Save a Life.

A pair of insulated pliers, in the hands of a man with great presence of mind, was the means of saving a boy's life in Greenville, N. J., recently. A gang of telephone linemen cut a telephone wire on top of a building and the wire fell across the trolley line in the street. The boy was on his way home from school and walked up to the wire, intending to hold it until the lineman came down from the roof. As soon as he touched the wire he sank to the ground powerless. A man ran out from a store and was about to grab the wire when Thomas F. White, connected with the electrical department of the Jersey City and Bergen Railway Company, saw the occurrence, jumped off a car and ordered the man not to touch the wire. He pulled a pair of insulated pliers from his pocket and cut the telephone line, thereby saving the boy's life.

In a recent communication from Mr. White, he says that the pliers he used were a pair of eight inch moulded mica pliers, made by the H. W. Johns Manufacturing Company, of 87 Maiden Lane, New York, and that the wire was cut quickly and easily, without the slightest shock to himself. Without the pliers, Mr. White writes, nothing could have been done to save the boy's life. We think that compliments are in order, not only to Mr. White, for his great presence of mind, but also to the makers of the pliers, which proved to be of such good quality.

The Berlin Iron Bridge Company Gets a Good Contract.

The Turner & Seymour Manufacturing Company, of Torrington, Conn., have decided to build their new foundry of iron, and have placed the contract with the Berlin Iron Bridge Company, of East Berlin, Conn. The old foundry burned a short time ago, and the company have determined to build the new foundry entirely of iron and brick, the side walls of brick, the roof of iron. The roof will be furnished by the Berlin Iron Bridge Company, of East Berlin, Conn., and will consist of iron trusses and iron purlins covered with the Berlin Iron Bridge Company's patent anti condensation corrugated iron. When completed, the building will contain no woodwork whatever, except the window frames and casings, so that it will be absolutely fire-proof, and it is the intention of the Turner & Seymour Manufacturing Company to carry no insurance on the building, as the Berlin Company guarantee that if all the wooden flasks which the company use at any one time were piled in one place in the building and fired, the roof would suffer no damage.

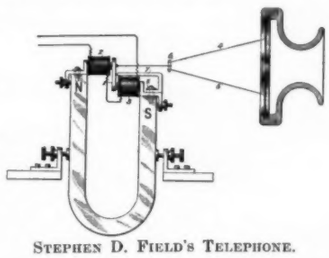
The Patent Office Report.

The annual report of Commissioner Seymour, of the Patent Office, shows that during the last fiscal year the number of patents granted, including re-issues and designs, was 23,471; trade marks issued, 1,884. The number of patents which expired during the year was 13,672. The receipts for the year from all sources were $1,288,809, and the expenditures, $1,111,444, leaving a surplus of $177,365. This is an increase in receipts of $20,082 and a decrease in expenditures for the year of $2,690. The total balance now in the treasury to the credit of the Patent Office is $4,279,805. Commissioner Seymour reiterates the complaints of his predecessors against the overcrowded condition of the Patent Office, and says that this congested condition and the defects in ventilation, light and heat are a public loss, and a daily wrong to the employés of the government.

A New Telephone.

AN IMPROVED MAGNETO TELEPHONE INVENTED BY STEPHEN D. FIELD.

One of the latest improvements in magneto telephony is the Field multidiaphragm magneto transmitter. In this instrument a number of independent diaphragms are placed within range of a common mouth-piece, and are connected mechanically with a bar armature which rocks in a magnetic field. The invention will be understood from an examination of the accompanying diagram. As will be seen, each diaphragm is mechanically connected with an armature 1, which is pivotally mounted in a magnetic field, the



STEPHEN D. FIELD'S TELEPHONE.

two extremities confronting the north and south poles of a permanent magnet. The pivot should be as near as possible to the center of gravity of the armature, so as to give the latter a neutral vibratory rate, so that it will not impose upon line any electrical vibrations due to a rate of its own. The permanent magnet will preferably be provided with soft iron pole-pieces, upon which the generating coils are supported. The armature is poised upon needle points entering pockets at its longitudinal center, and will be normally strongly attracted by the poles of the magnet, thus keeping the cords or wires which connect it with the diaphragm in a normal condition of strain. Each diaphragm is connected by a core or wire with an equalizing bar 6, which, in turn, is connected with one end of the armature. The diaphragms are placed at the same distance from the mouth-piece. The coils 2 and 3 are connected directly with the line.

Several important incidents follow the construction just described. One of the most important is that by reason of the armature being independent, it may be given a sufficient cross-section to carry a large number of lines of force. In ordinary magneto instruments the diaphragm being the only medium for varying the intensity of the magnetic field, and being necessarily very thin to be responsive to sound waves, produces but slight variation in the intensity of the magnetic field; but with such a structure as herein described, the cross-section of the independent armature may be made quite large, and any variation of its position in obedience to the movements of the diaphragm will produce a wide variation in the strength of the magnetic field.

Another very important advantage follows from the employment of a plurality of diaphragms. The energy developed by the voice in speech is transmitted to the whole body of air surrounding the speaker, and is capable of affecting any number of diaphragms which may be brought within range of his voice, so that by employing a number of diaphragms the power of the instrument is multiplied in proportion to the number, and all co-operate, through the equalizing bar, in exerting mechanical force upon the armature; therefore, the inductive power of the instrument is multiplied.

It is said that this instrument compares very well in power with carbon telephones. It has been used successfully in transmitting and receiving over an 80 mile circuit, and it is thought will be capable of successful work over a much greater distance.

The gross earnings of the West End Street Railway Company, of Boston, for October, showed very little change as compared with same period in 1892.

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These are not the days for croakers of evil. This is a great, big, prosperous country, and the company that comes out strong before the public with something good to offer is sure to be welcomed. Have confidence in yourself as well as in your neighbor.

The persuasive advertiser speaks in joyful tones to the readers of the ELECTRICAL REVIEW this week. There is much to interest you in what he says, and it proves his faith in the prosperity of this country and his belief in the return of the days of big orders for good goods.

Down in Colbert, Ala., they have a new kind of electric cells. They are in a jail which has just been built, and the sheriff says it will be easier for the prisoners to get out of purgatory than it will be to get out of these cells after he throws the switch. It is not exactly a storage battery, but then again it is when you think of it the second time.

Mrs. Elizabeth Shute, the widow of the late William Shute, who bequeathed the electrical fountain to the city of Lynn, Mass., which was described in our columns in the issue of October 14, survived her husband but a short time. In her will she has carried out the same benevolent policy as that of her husband, distributing $30,000 to the hospital and other organized charities of Lynn, and also making the city a residuary legatee to an amount estimated to be in excess of $100,000 for a public library building. The public library of the city of Lynn is contained in a portion of the city hall where the accommodations for a library of nearly 100,000 volumes are entirely inadequate, many of the books being kept in the attic of the building. The large number of persons connected with the General Electric Company make an unusual demand for the latest scientific works on engineering and electricity at the Lynn public library, which requires an unusually large proportion of so-called "solid" works for this institution.

MAGNETO TELEPHONY.

In view of the near approach of the expiration of the Bell receiver patent, a number of inventors are actively engaged in preparing to enter the field of magneto telephony. There are many applications for which a pure magneto system is well adapted, such as the use on individual lines, which will soon be free, but its indiscriminate use will not be open to the public for some years, inasmuch as there are existing patents controlled by the American Bell Telephone Company, which it is the general impression control systems using central station apparatus; but on January 30 next will expire the patent for the Bell receiver, and as the earlier patent for magneto transmission expired some months ago, the field will be thrown open to the public for use on individual lines. This patent contains the following claims:

1. The union upon and by means of an electric circuit of two or more instruments, constructed for operation substantially as herein shown and described, so that if motion of any kind or form be produced in any way in the armature of any one of the said instruments, the armatures of all the other instruments upon the same circuit will be moved in like manner and form, and if such motion be produced in the former by sound, like sound will be produced by the motion of the latter.

2. In a system of electric telegraphy or telephony, consisting of transmitting and receiving instruments united upon an electric circuit, the production in the armature of each receiving instrument of any given motion by subjecting said armature to an attraction varying in intensity, however such variation may be produced in the magnet; and hence I claim the production of any given sound or sounds from the armature of the receiving instrument by subjecting said armature to an attraction varying in intensity, in such manner as to throw the armature into that form of vibration that characterizes the given sound or sounds.

3. The combination, with an electro-magnet, of a plate of iron or steel, or other material capable of inductive action, which can be thrown into vibration by the movement of surrounding air or by the attraction of a magnet.

4. In combination with a plate and electro-magnet, as before claimed, the means herein described, or their mechanical equivalents, of adjusting the relative position of the two so that, without touching, they may be set as closely together as possible.

5. The formation in an electric telephone, such as herein shown and described, of a magnet with a coil upon the end or ends of the magnet nearest the plate.

6. The combination, with an electric telephone such as described, of a sounding-box, substantially as herein shown and set forth.

7. In combination with an electric telephone, as herein described, the employment of a speaking or hearing tube for conveying sounds to or from the telephone, substantially as set forth.

8. In a system of electric telephony, the combination of a permanent magnet with a plate of iron or steel, or other material capable of inductive action, with coils upon the end or ends of said magnet nearest the plate, substantially as set forth.

This patent has recently proved a stumbling-block to a number of infringers who erroneously supposed that when the basic patent expired some months ago, the art of magneto telephony was thrown open to the public, but with the expiration of this patent both the receiver and the method of transmission by undulating currents will be matters of public property. It is to be noted that there are some other patents involving what might be styled "microphonic transmission" which will not expire for many years. The chief of these is the Berliner patent, granted November 17, 1891, which contains among others the following claim:

"An electric speaking telephone transmitter operated by sound-waves and consisting of a plate sensitive to said sound waves, electrodes in constant contact with each other and forming part of a circuit, which includes a battery or other source of electric energy, and adapted to increase and decrease the resistance of the electric circuit by the variation in pressure between them caused by the vibrational movement of said sensitive plate."

Exactly what scope the courts will give this claim, and indeed, whether or not it will be sustained, is a matter of some doubt, and much may be said upon both sides of the question, but as the matter now stands this patent is a menace to users who look longingly at carbon telephones, and it would be well for those who contemplate entering the telephone field to bear it in mind.

LETTERS FROM A LABORATORY.—LXXI.

BY JULIAN A. MOSES.

It has been said of a prominent inventor that once, after he had spent many sleepless nights and days of worry and work towards the completion of an invention, the crucial moment had arrived when he was to see his machine move and perform what it was calculated to do.

The day was one long to be remembered, and every workman in the shop had joined the anxious inventor. With breathless interest they waited for the wheels to go round. The inventor himself had made what he thought the most careful preparations. Closely he scrutinized each part of the apparatus to see that nothing was missing, and after thoroughly satisfying himself that all was in readiness, he turned the current on. It was, it might be said, the old story. As quiet as a huge rock it lay upon the bench, and not a wheel revolved and no promise of motion appeared. Hastily an ammeter was brought into requisition to see that all was right with the source of current. The current flowed and the inventor was in temporary despair. With nervous hands he again, this time, it seemed more carefully, examined each part. Everything appeared all right. Then there was a search for short circuits in the machine, and every possible complicated condition was looked for. Finally, as a last resort, connections were again made, but not a wheel revolved. Suddenly, one of the workmen, who had been a silent spectator, remarked in a tone of suggestion:

"Professor, don't you think it would be a good idea to throw the switch?"

Realizing instantly this gross oversight, the inventor did as suggested, and all worked to perfection.

It would be easier to imagine than describe the professor's feelings; but he merely made use of the following well-known saying of Davy Crockett, which was so *apropos* that I believe it will always remain indelibly impressed, associated as it was with an event of such importance, in the minds of all present.

Turning round to his associates, he said with a warning gesture: "Be sure you're right, then go ahead. Follow that piece of advice and you will be saved many trials and disappointments."

It is not difficult to realize the value of this piece of advice in dealing with matters other than those electrical. Much trouble will be saved by a strict adherence to this line. In all experimenting it is time saved that is time spent in making sure.

Stories of the progress of inventions will show that the experimenter who has been careful in the details, being as sure as possible of the correctness of the small steps, has made advances which have been slow, but decided. It would then appear, from this, that conservative inventors, while they achieve results, do not accomplish as much as their bolder brethren who branch out further into the realms of the unknown. But then the question of expenditures arises and in this respect the conservative inventor has the advantage. If such a thing were possible there should be no limit to the resources of a practical inventor. His good judgment should tell him when he oversteps the bounds of prudence in an outlay. The inventor, however, must carry his burden, and in many cases this is the lack of available funds. He is not able to draw on his ofttimes brilliant future, and must work along in his quiet way waiting to realize as best he can.

"Be sure you're right, then go ahead."

Indecision is a poor thing to rely on. It will fail you every time. Of course, it can be said that it is impossible to be absolutely sure of a result. There are no prophets who have nothing upon which to base their prophesies. It is difficult to foretell. Only by following up a chain of reasoning, or by adhering to definite laws, can an event be prophesied, but in following these absolute rules everything is a matter of consequence, and may, therefore, if the reasoning be correct, be accurately determined not as an uncertain result, but as something which, if the conditions do not fail, is bound by all natural laws to occur.

CORRESPONDENCE.

OUR WESTERN LETTER.

One of Chicago's well-known supply houses will incorporate under a new title at the beginning of the year.

The Chicago Electrical Association held its first meeting of the season on Tuesday evening, November 7, in room 913, Masonic Temple, and outlined a programme for future work.

Obituary.—James W. Scoville, a resident of Oak Park, a Chicago suburb, president of the Cicero Water, Gas and Electric Light Company, and noted for his philanthropic works, died at Pasadena, Cal., on November 2.

Mr. William Taylor, 348 Dearborn street, Chicago, reports a gratifying increase in orders, and is so firmly convinced that the new year's business will develop rapidly that he is arranging to handle several new specialties.

Prof. O. G. Dodge, chief inspector of the electrical department at Jackson Park, was tendered a formal dinner at Kinsley's, on Thursday, prior to leaving for Washington, where he will resume his official duties in the Naval Academy.

The Standard Electric Company, Home Insurance Building, Chicago, are gaining the well-earned title of successful quiet workers, for they are daily booking orders for arc lighting apparatus for both central station and isolated plants, yet spend no time boasting of their sales.

The North Chicago Street Railway Company lost their Racine avenue buildings by fire on Thursday, together with 43 cars and 10 Connolly Belgian gas motors. The destruction was complete, the loss being about $75,000. Six gas motors are yet in service, and the destroyed machines will be replaced by motors of improved pattern.

The Charles E. Gregory Company, 45 Jefferson street, Chicago, sold 33 dynamos last month, or an average of one daily; a record that is remarkable. A gratifying feature of these sales is that they are scattered over the entire country, from the Atlantic to the Pacific. Mr. Gregory purchased a large number of second-hand motors from World's Fair exhibitors, which he is rapidly disposing of at low prices.

Cushing & Morse, the general agents for Kerite, have arranged an exhibit at their offices, 225 Dearborn street, Chicago, of the various telephone and telegraph cables, both submarine and aerial, electric light and power conductors and cords, that won the prizes at the World's Fair. And suspended above the display are the official blue ribbons presented by the jury of awards. A cordial invitation to inspect this display is extended to all interested in high-grade insulation.

The Falls Rivet and Machine Company, Cuyahoga Falls, Ohio, have completed several orders for shipment to foreign countries, including complete equipments of shafting, clutch couplings, pulleys, etc. In addition thereto, they have secured the cream of the heavy power transmission installations, and can point with pride to the remarkable records for efficiency, economy and perfect running secured from their equipment in electric light and electric railway stations.

Illuminated Indian Clubs.—Mr. G. W. Patterson, with Cushing & Morse, 225 Dearborn street, Chicago, is giving private exhibitions of club exercises with a pair of Indian clubs having 33 miniature colored incandescent lamps attached to each, eight on each of four sides and one on the top of the club. A 110 volt current is supplied, the circuits being attached so as to allow of the utmost flexibility of movement. As a novel and attractive exhibition, it is certainly a success.

Dr. G. A. Gessner, vice-president of the American Carbon Company, Dayton, Ohio, and Noblesville, Ind., is a welcome visitor in Chicago this week. Dr. Gessner is a strong believer in the principle of thoroughly doing whatever work may be in hand, and he has endeavored to impress it on each individual in his employ, whether engaged in the preparation of the material for the carbons, in grinding it to the proper degree of fineness, in baking at the proper temperature, or in the careful sorting over of the carbons before packing and shipping.

Cruelty to Cats.—The following is a bit of testimony given in a trial for cruelty to animals, in which a fine of $20 was imposed and notice of appeal given: "The device originated in my desire to abate the great noise made in our yard at night by the neighbors' cats. I tried to get rid of them by throwing bootjacks and shoes and everything I could get my hands on at them, but they would come back again the next night. Then I got up this electrical device to explode a little powder and see if we could not rid ourselves of them permanently. I fixed a primary battery so I could set it off from the kitchen, and when I touched the button the powder exploded. I did not put any meat there to attract them, as they came of their own accord. I did not intend any cruelty."

The Ansonia Electric Company report that they are in receipt of favorable replies to the proposition to turn over to the Chicago Title and Trust Company an amount of cash equal to 10 per cent. of the total claims; merchandise to an amount the present market value of which shall be equal to 25 per cent. of the total claims, the market value of any article in no case to exceed the original cost; and book accounts and bills receivable due the Ansonia Electric Company of a face value equal to 25 per cent. of the total claims. The Trust Company is to distribute the receipts *pro rata* among the creditors, and the Ansonia Company will be its agent until final settlement. There are said to be many of the creditors who fail to see where they come in on this proposition, and it is doubtful if a sufficient number will accept.

The World's Fair.—The Intramural Railway trains were withdrawn on Wednesday, and the removal of the elevated structure is now under way.—An average of only 2,000 visitors a day are entering the gates.—The Ferris wheel is still the greatest revolver of the age, though carrying few passengers. The wheel cost $412,000, and the receipts have exceeded $600,000. Mr. Ferris has many offers of a permanent location for the wheel from park commissioners in different cities.—The "Empire State Express, 999," the mammoth locomotive exhibited by the New York Central Railway, will draw a special train composed of Wagner coaches to New York city in a few days. An effort may then be made to reduce present records by running a portion of the distance at a speed of two miles a minute.—The aggregate figures of the Illinois Central Railway's transportation service are most remarkable, and include, suburban, 9,559,791; World's Fair, 8,779,393, and through trains, 1,003,600. Total, 19,342,684 passengers.

World's Fair Notes.—Light and heat.—The only buildings now heated are the Administration, the Service and the Horticultural Building. Electric power is supplied only for the motors operating the big cranes in Machinery Hall, the elevators in the Administration, Transportation and Manufactures Building. The receipts from this source for the five months ending September 30, aggregate $225,000, which is made up as follows: Light, $170,000; power, $30,000; compressed air, $5,000. All the lights have been cut off, save in the three buildings occupied by the clerical forces, and where patrol circuits are still maintained. The World's Fair Steamship Company carried 1,758,665 passengers to or from Jackson Park, but it is very doubtful if the business proved a profitable one. The electric launches carried 839,757 paid passengers during the season, a daily average of 4,589, securing a gross income of $419,878.50, a fair proportion of which was profit. The steam launches carried 196,698 passengers during the season, at 50 cents each, making an average of 1,075 per day, for which they received the gross sum of $98,348. The gondolas carried 149,192 passengers, averaging 815 a day, and at 50 cents for each passenger the company probably made a reasonable profit.

Chicago, Nov. 11. F. DE L.

PERSONAL.

Mr. W. C. Bryant, of the Bryant Electric Company, Bridgeport, Conn., made the ELECTRICAL REVIEW a pleasant call last week.

Capt. W. L. Candee, managing director of the International Okonite Company, Ltd., sailed for Europe on the "Lucania" last Saturday on business for his company.

Mr. Henry T. Edwards, who is well known to old timers in the electrical field, was in New York last week and called on the ELECTRICAL REVIEW. Mr. Edwards is now located in Boston in the electric and gas fixture business, and is sole agent for the General Fixture Company.

Mr. Geo. O. Fairbanks, formerly connected with the Westinghouse Electric and Manufacturing Company, is now one of the members of the staff of W. R. Mason, general manager of the Railway Equipment Company, of Chicago. Mr. Fairbanks will pay special attention to the wire supply department.

Mr. Charles A. Schieren was elected mayor of Brooklyn on the Republican ticket by an overwhelming majority on November 7. Mr. Schieren is an honest, progressive, able and broad-minded gentleman, and will undoubtedly wisely and progressively administer the affairs of the great city which has so highly honored him.

Wall Street and the Electrical Stock Market.

The Wall Street market during the past week has been almost entirely professional with the bear contingent in control. Its record is one of fluctuation over a narrow margin and a tendency towards lower values. The week opened with a comparatively heavy short interest, which was increased on Monday, and on the day following a covering movement set in which rallied prices. This has been the history of the succeeding days. Two things were demonstrated, viz., that the bears found it impossible to cover to any great extent without putting up the market on themselves and that the bull party lacked organization and aggressive interests. In the face of this professionalism, which is deplored by every legitimate investor, the only redeeming feature of the market was its narrowness. Wall Street does not take a very hopeful view of the immediate future. Conservative interests can see nothing in sight for use as a basis of higher values. Now that the World's Fair is over, railroad earnings have commenced to show decreases, while the industrial development which was looked for after the repeal of the Sherman silver law has not taken place.

Had the repeal come two months earlier it would undoubtedly have been followed by a revival. Under the present circumstances it was too late to stimulate Fall business. The threatened tariff legislation is the great bug-a-boo of the Street and until something definite is known regarding the nature of the proposed bill, it will be the controlling element of uncertainty in the financial situation. Eminent authorities disagree as to the construction which should be put upon the Republican victory in its bearing on the tariff. Some make the point that it means that the will of the people is opposed to a change in the tariff, others that the will of the people expressed in the election was a protest against the present industrial stagnation without trying to define the causes therefor. The argument has been made that an expression of the people, which might be clearly construed as opposed to the tariff revision, before the party which was elected nine months ago for this express purpose has had time to act, indicates a too great elasticity in the public mind; one which promises uncertainty in our financial system for a prolonged period. As uncertainty is a sure check to development, this point is well worth serious consideration. It is quite evident that Europe did not regard the signs of the election with favor. That part of the world is out-and-out for free trade with America, and any measure tending to prevent it will have the effect of checking prosperity abroad and the investment in American securities.

When such important events as the repeal of the Sherman silver law and a complete change in public sentiment fail to affect the market, it is difficult to see on the horizon any signs that it will be pulled out of its lethargy. A revival of trade is the only thing, and while this may come freely after the first of the year, there are now no visible prospects which will warrant as roseate a view. A number of conditions developed during this week which will have a tendency to improve the situation, and their development is being watched with vital interest. The smash in the steel rail combination, and the consequent dropping of steel rails to nine dollars per ton, or to a cost price, may revolutionize the entire industry. If the railroads start in to buy they will quickly absorb the stocks of pig iron on hand, which, being something like a million tons, are scarcely more than one month's supply under normal conditions. This would give the iron industry a stimulus that would extend either in a direct or reflex way to every hamlet, and might be the basis for a substantial industrial growth. Far-sighted capitalists have already reached the conclusion that the condition of 1894 crops will determine the extent of our prosperity. Any light which may develop from time to time on this factor should be regarded as very important.

The electrical stock market was both dull and quiet and, barring Western Union, was without special feature. There is at the present time a good demand for the better class of railroad bonds from business men who have made up their minds that there will be no activity before the first of the year, and who are placing their capital in dividend paying securities on which they can quickly realize. Money is also growing very cheap. The surplus in the banks is increasing, and there must, before long, be a first-class demand for the better grades of securities. While the electrical securities of the inactive list are not generally favored by the investment purpose, they always have a certain following in times of easy money, and we look for a more general inquiry. This view is based upon the fact that while these securities declined to bottom prices, owing to their inactivity, they did not advance when the revival in the general market took place.

Western Union, as compared with its course last week, was quiet at scarcely unchanged prices. On Monday it sold at 86½ to 88, touched 89 Wednesday and weakened with the balance of the market, touching 87⅞ to-day. There was a strong undercurrent of support around bottom figures, and an absence of marked bear antagonism.

General Electric reached 47 on Wednesday and closed at 42½ to-day, the lowest figure of the week. The professional speculator regards 42, for a non dividend paying stock, as altogether too high, while the investor is beginning to realize that dividends are of necessity a good way off. The officers of the company report that business is picking up. However, they have nothing to say as to the price at which this business is being taken.

Edison Electric Illuminating was not dealt in. The first five per cent. bonds sold at 104.

American District Telegraph and Cable sold at 44 and 45. The directors of this company declared a dividend Thursday of one per cent., made payable December 18. While the statements presented by the treasurer showed a falling off in the gross earnings of the company during the Summer months, it was also shown that a large reduction had been made in the operating expenses. The Treasury reported that there had been quite an improvement in the volume of business since the first of November, and also that the new electrical department recently established for the care of electrical bells, burglar alarms, etc., was meeting with great favor and would be a source of profit to the company. The discontinuance of the monthly rental on the call boxes has given satisfaction to the subscribers, and a large increase in the messenger service was anticipated in consequence of the withdrawal of this charge. The company now has 30,000 subscribers in New York city.

In the Boston market Bell Telephone showed further weakness, dropping from 198. Erie Telephone on limited transactions was steady at 42½. General Electric preferred was quoted at 78 and 80. New England Telephone sold at from 53 to 55. Westinghouse preferred was bid at 47 and offered at 47¼. The assenting certificates were bid 25¾ and offered at 26.

The market for lake copper is quoted at 9⅞ to 10 cents. The demand is limited, and producers are assuming an independent attitude on the belief that manufacturers will be forced into the market, as their stocks are known to be short. The production is still heavy. The export demand is about the only market at the present moment. There is a revival of talk of a copper combination, in which the names of the Rothschilds, Baron Hirsch and Lewisohn Brothers are mentioned. It lacks confirmation.

New York, November 11.

Important Lamp Decision.

The United States Circuit Court of Appeals decided on Monday of this week that the Edison Illuminating Company of New York was bound to furnish other electric companies with incandescent lamps on reasonable terms.

This breaks the monopoly here, and will establish a precedent for the entire country.

A One Volt Standard Cell.

BY HENRY S. CARHART.

(From the American Journal of Science.)

The calomel cell, consisting of mercury in contact with mercurous chloride and zinc in a solution of zinc chloride, was first described by von Helmholtz in 1882. Without any knowledge of its previous invention I made the same cell six years ago and have still the first sample made at that time. Ostwald refers to a calomel cell giving one volt electro-motive force at 15 degrees C., the density of the zinc chloride being 1.409 at 15 degrees, and the temperature co-efficient +.00007 volt per degree.

Within the last few months I have taken up the calomel cell again with a view of adjusting it to precisely one volt, making a careful determination of its temperature co-efficient, and investigating its reliability.

It is now well known that the electro-motive force of a voltaic cell with zinc immersed in a solution of one of its salts decreases with increase of density of the solution. Within limits, therefore, the electro-motive force of a cell can be varied by changing the density of the solution of the zinc salt. Thus, the electro-motive force of a Clark cell was found to vary from 1.434 volts with a solution saturated at 20 degrees C. to 1.481 volts with a five per cent. solution, a variation of nearly three and one-third per cent.

The variation of the electro-motive force with density is even greater in the case of zinc chloride. With zinc chloride 16 per cent. increase of density produces 3.5 per cent. decrease in electro-motive force. An equal increase of density of zinc sulphate is accompanied by only half the percentage decrease of electro-motive force. Hence greater care is necessary in standardizing a solution of zinc chloride than of zinc sulphate.

Taking the Clark cell with excess of crystals of zinc sulphate as the standard, having an electro-motive force of 1.434 volts at 15 degrees C., I have found that the density of the zinc chloride solution required to give one volt is 1.391 at 15 degrees C. Ostwald's density gives too low a value. It was probably adjusted to correspond with the legal ohm.

The cell is made in the same form as my Clark standard. In the bottom of the tube is pure mercury in contact with a platinum wire; on this a paste of mercurous chloride and the zinc chloride solution; a cork diaphragm follows, holding the mercury and paste firmly in position, especially with some asbestos packing under the cork; zinc chloride is then added to the proper depth, and an amalgamated zinc rod, supported by a cork, completes the electrical combination of parts. The cell must be hermetically sealed as usual. Such a cell is perfectly portable and gives promise of long life. Its internal resistance is about 1,500 ohms, and it does not appear to suffer permanent change by heating to 50 degrees C. or even to 60 degrees. The cell six years old, already mentioned, is still in good condition and has apparently maintained its electro-motive force.

An interesting feature of this cell is its small positive temperature co-efficient. It is well-known that the co-efficient of the Clark and the Daniell standard is negative. The calomel cell has a co-efficient of about +.00009 within working limits of temperature. In the following table will be found the data of one series of observations on the temperature co-efficient:

TABLE I.

No. 30. Clark.		No. 8. $ZnCl_2$.		
Resistance to balance.	Temp. C.	Resistance to balance.	Temp. C.	Electro-motive force in volts.
9401	18°.25	6572	13°.7	1.0000
		6608	48.9	1.0055
		6604	48.0	1.0049
		6598	45.4	1.0040
		6592	40.7	1.0031
		6589	36.4	1.0025
9402+	18°.25	6586	30.2	1.0020
		6583	26.7	1.0016
		6581	23.7	1.0013
		6579	20.4	1.0010
		6577	17.2	1.0007
		6576	15.0	1.0005
9403	18°.1	6573.5	10.0	1.0001

The electro-motive force of the Clark is taken as 1.434 at 15 degrees; temperature co-efficient —.00077. It will be observed that the cell does not recover its normal electro-motive force immediately on descending temperatures. This hysteresis phenomenon, however, is small, amounting only to an error equivalent to about three degrees of temperature. The entire change of temperature of about 40 degrees took place within three hours. The observations of the table are plotted in the curve of Fig. 1. The curve is approximately a straight line between 10 and 40 degrees. Beyond this point the co-efficient increases rapidly. The equation of the curve contains not only a quadratic term but one which is a function of a still higher power of the temperature. The following equation fits the observations fairly well:

$$E_t = 1 + .000085\,(t-15) + .0000006\,(t-15)^2 + .00000001\,(t-15)^3.$$

Between 10 and 30 degrees the relation between electro-motive force and temperature may be expressed as follows:

$$E_t = 1 + .000094\,(t-15).$$

The co-efficient is, therefore, a little less than $\frac{1}{1000}$ per cent. per degree. A neglected variation of temperature of 10 degrees C can cause an error of only $\frac{1}{10}$ per cent.

In another paper I have given an analysis of the temperature co-efficient of both the Clark and the Daniell cell when the former contains no excess of zinc sulphate crystals,

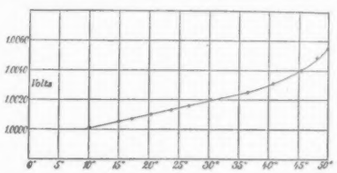


FIG. 1.—OBSERVATIONS OF CLARK CELL.

and have shown that this co-efficient is a purely thermo-electric phenomenon at the contact of a metal and a liquid. Further investigations confirm this conclusion that the temperature co-efficient of a voltaic cell is the result of the superposition of the two thermo-electro-motive forces of the metal and the salt in contact with it on the two sides of the cell, whenever this co-efficient is not complicated with oxidation effects and the solution and re-crystallization of salts. In the old Clark cell almost exactly half the temperature co-efficient is due to changes in density of the solution by reason of the presence of an excess of zinc sulphate crystals.

These dissolve when the temperature rises and again slowly crystallize out on a falling temperature. Time is required for diffusion, and the cell is, therefore, slow in reaching its electrical equilibrium after a temperature change. This time lag may extend over several days. It is very appreciable when the temperature change does not exceed one degree an hour.

Whether a resultant temperature co-efficient shall be positive or negative depends upon the relative values and the signs of the two thermo-electro motive forces at the two sides of the couple. To measure these electro-motive forces of thermal origin I have made use of an experimental cell consisting of two glass tubes 12 centimetres long and one to two centimetres in diameter, joined near the top by a small tube 17 centimetres long, having near the middle a narrow bore made by thickening the walls of the tube. When it is desirable to use two liquids, a plug of asbestos is placed at the narrow part of the connecting tube to aid in filling without admixture of the liquids and to diminish diffusion. When the thermo-electro-motive force between a metal and a liquid is to be determined, the experimental cell is filled with the liquid and wires of the same metal, cut from one piece, are inserted in the two limbs. One limb is then kept in melting ice and the other is raised to different temperatures, and the resulting electro-motive force measured. For this latter purpose the most exact method, giving practically an electrostatic measurement, is to balance the electro-motive force of a standard cell against the fall of potential over the requisite resistance in a circuit of constant high resistance (10,000 ohms), as in the Rayleigh or compensation method of comparing electro-motive forces. The experimental cell is then put in series with the standard cell, and the resistance in the shunt of the main circuit required to maintain a balance shows both the value and the direction of the electro-motive force of the experimental cell as compared with the standard.

By this method the mean thermo-electro-motive force of Cu—$CuSO_4$—Cu per degree between 0 degree C. and 50 degrees C. I have found to be + .00073 volt. The positive sign indicates that the metal in the warm solution is positive externally to the one in the cold, or the metal in the cold plays the part of the zinc of a voltaic couple. Bouty gives the electro-motive force of Fe—$FeSO_4$—Fe as zero. It follows that a couple consisting of Fe—$FeSO_4$—$CuSO_4$—Cu should have a positive temperature co-efficient, and this co-efficient should be the same whether the whole cell is heated or only the copper—copper sulphate side. Experiment confirms the first conclusion at least. The electro-motive force of the cell at 15 degrees C. was found to be 0.625 volt, and at 29.4 degrees C., 0.637 volt. The change is, therefore, +0.000833 volt per degree and the co-efficient is 0.000833÷0.625=0.0013, or over $\frac{1}{10}$ per cent.

Theoretically it should be

$$0.00073 \div 0.625 = 0.0012.$$

The above combination is now used as an iron gravity battery, and the change in its electro-motive force with a sudden change of the temperature of the room had attracted my attention before I had investigated the temperature co-efficient. After the above iron-copper cell had been left standing for 24 hours, with a piece of iron wire in the connecting tube of the experimental cell to intercept the $CuSO_4$ which might diffuse over, the electro-motive force was found to be 0.651 volt at 14.4 degrees C.; and for a range of 7.7 degrees the temperature co-efficient was 0.0012. This is exactly the value obtained from theoretical considerations.

Another case in point is that of the voltaic series.

Ni—$NiSO_4$—$CuSO_4$—Cu.

The electro-motive force was quite variable and only an approximate measurement could be made. The temperature co-efficient was positive and equal to 0.0084, or over eight-tenths per cent. per degree C. The actual change in electro-motive force was greater than this, for the electro-motive force continued to fall on standing and the change by heating was thus in part masked.

The thermal—electro-motive force of copper—copper sulphate, is positive, while that of nickel—nickel sulphate is negative. Hence the temperature co-efficient of the above series should be positive and equal to the sum of the two thermal electro-motive forces. The result is positive but not equal to the sum of the two thermal electro-motive force values. Perhaps no closer numercial agreement could be expected in the case of a variable electro-motive force.

In the light of the above conclusions and with thermo-electric data furnished by Bouty and by Chroustchoff and Sitnikoff it is easy to draw the conclusions that the temperature co-efficient of the calomel cell should be negative and of small value.

The thermo-electro-motive force or value of $\frac{dE}{dT}$ for Zn—$ZnCl_2$—Zn is given by Bouty as 0.000696; Chroustchoff and Sitnikoff found that of Hg—Hg_2Cl_2—$ZnCl_2$—Hg_2Cl_2—Hg to be 0.00066 between 0 degree and 50 degrees C.

Hence the co-efficient should be,

$$0.00066 - 0.000696 = -0.000036.$$

The value of $\frac{dE}{dT}$ for zinc in zinc salts given by Chroustchoff and Sitnikoff would give a larger negative co-efficient than the above.

I have, therefore, investigated this subject to ascertain if this case furnishes an exception to the law of temperature co-efficients already announced. The result confirms the law and shows Bouty's result to be in error. The determinations were made by means of the experimental cell in the manner already indicated. Tables II and III contain the observations which are expressed graphically in the two curves of Fig. 2, in which A relates to Zn—$ZnCl_2$—Zn, Table II, and B to Hg—Hg_2Cl_2—$ZnCl_2$—Hg_2Cl_2—Hg, Table III.

TABLE II.

Difference of Temperature	Total electro-motive force in volts.	Electro-motive force per degree C.
49.0°	.02876	.000587
45.5	.02662	.000585
42.9	.02570	.000579
39.4	.02295	.000582
34.8	.02050	.000589
32.4	.01913	.000590
28.9	.01668	.000577
26.1	.01499	.000574
22.5	.01301	.000578
18.0	.01040	.000580
12.6	.00750	.000595
10.6	.00612	.000577
8.4	.00490	.000583
	Mean,	+.000584

TABLE III.

Difference of Temperature.	Total electro-motive force in volts.	Electro-motive force per degree C.
47.8°	.03314	.000693
45.4	.03146	.000693
42.8	.02949	.000689
39.4	.02706	.000686
37.1	.02554	.000688
34.4	.02340	.000680
32.1	.02174	.000677
28.2	.01928	.000687
25.6	.01729	.000675
23.1	.01561	.000675
20.1	.01353	.000673
16.8	.01125	.000669
13.2	.00882	.000668
10.9	.00730	.000669
7.4	.00517	.000698
	Mean,	+.000681

Both of these thermal electro-motive forces are positive. The temperature co-efficient should, therefore, be 0.000681—0.000584= 0.000097 as a mean. This corresponds very closely indeed with the value found by observation on a one volt cell. It will be observed that it is only necessary to take the difference of the above electro-motive forces to obtain the temperature co-efficient, since the electro-motive force of the cell is one volt. The co-efficient is positive because the value of $\frac{dE}{dT}$ for the positive side of the cell is in excess of that for the negative side.

A Good Whitewash and How to Use It.

The whitewash used by the United States Government for covering light houses is made by mixing with fresh water, in the most thorough manner, three parts Rosendale cement and one part of fine clean sand, this giving a gray or granite color, dark or light, according to the color of the cement. If a very light color is desired, lime is used with the cement and sand; if brick color is sought, enough Venetian red is added to the original mixture to insure that result. Care is exercised to have the various ingredients well mixed together; also, in applying

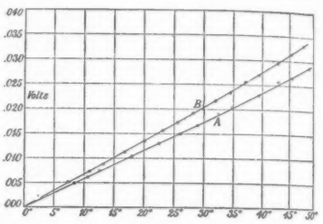


FIG. 2.—CURVES FROM TABLES II AND III.

the wash, to have the wall wet with clean fresh water; following immediately with the cement wash. This method preventing the bricks from absorbing the water from the wash too rapidly, and it also gives time for the cement to be properly set. The mixture is made as thick as can be conveniently applied with a whitewash brush in the usual manner, and the wash is well stirred during the process of its application. It is stated, however, that though this mixture is so admirably suited for the purpose in question, it cannot be used to advantage over paint or whitewash.

The Complete Electric Construction Company.

At a meeting of the board of directors of the Complete Electric Construction Company, 121 Liberty street, New York, held last week, the following new directors and officers were elected:

Mr. John A. Seely, president and general manager; Mr. W. H. Baker, of the Postal Telegraph Company, vice-president; Mr. C. O. Baker, Jr., of Baker & Company, platinum refiners, secretary and treasurer; Mr. George G. Ward, of the Commercial Cable Company, and Mr. George F. Porter, secretary of the National Electric Light Association, directors.

Mr. C. O. Baker, Jr., retains his interest in Baker & Company, and his position there will be unaffected by his connection with this company.

The Complete Electric Construction Company has an exceptionally strong and able *personnel*, and will, doubtless, prove to be an important factor among electrical contracting companies.

An Experiment to Try.

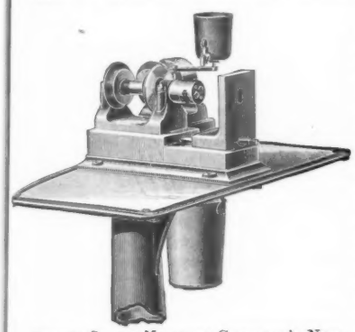
How is this for a novel idea?

One of the most ingenious and ornamental schemes of ball-room decoration that has appeared this season is the idea of a London iceman of freezing incandescent lamps into large and prettily moulded pieces of ice. Such decorations serve the double purpose of giving forth both coolness and light.

Does it not seem possible that the electric light would produce a little heat, and thus make very complicated results? Like the fish and globe story of old, the best way to verify this statement would be to try the experiment.

Tapping Machine for Electrical Work.

The Dwight Slate Machine Company, of Hartford, Conn., have placed upon the market an ingenious tapping machine for screw holes, from No. 4, 36 to No. 10, 24 thread, or quarter-inch. In the main the machine consists of a driving shaft, with pulley three inches diameter, one seven-eighth inch face. A cone, which runs between two corresponding ones on the arbor, which has a slight end movement, carries the chuck. A knee, running on dovetail ways, is provided for holding the work, and a little giant chuck, from 3/8 to 0, is fitted to each machine. Its operation is very simple, yet ingenious, and at the present time it is being used in the shops of leading clock manufacturing concerns. Its application to electrical work is



DWIGHT SLATE MACHINE COMPANY'S NEW TAPPING MACHINE.

obvious, and as it is declared that the machine will be placed on the market at a very moderate figure, a large sale may be expected.

The Use of Gas Motors in Germany.

Mr. Frank H. Mason, United States Consul-General at Frankfort-on-the-Main, Germany, has transmitted a report on the above subject to the Department of State, under date of October 6, 1893, as follows:

Prominent among the economies which have been introduced during recent years in Germany is the use of gas motors in place of steam engines in all the smaller forms of manufacture where the motor force required does not exceed 75 to 100 horse-power. At the Frankfort Electrical Exposition of 1891 most of the dynamos were driven by gas and caloric engines, and the display of these motors at that time was almost as varied and interesting to the general public as that of the electrical apparatus to which they were technically subsidiary.

There were in operation at that time throughout Germany about 18,000 gas motors, with an aggregate force of 60,000 horse-power. Since then the gradual cheapening of gas and the rapid extension of electrical lighting and electrolysis have combined to increase very rapidly the use of gas motors, the effectiveness and economy of which were so brilliantly demonstrated at the Frankfort Exposition. No statistics are available to show the precise number that are at present in use, but, as the two principal makers of gas engines in Germany have alone made and delivered during the past two years 1,950 motors, it may fairly be inferred that the number in actual service in this country is not far short of 24,000 or 25,000.

Meanwhile the progress that has been made in improving the machines and increasing their economy has been quite remarkable. The first gas motors, which were exhibited and used experimentally about 1868, were fatally extravagant. The Lenoir machine, which was the best model known to Germany as late as 1861, used—according to a recent statement in Kuhlow's Trade Review—1,235 cubic feet of gas per horse-power per hour, whereas the motors now in use consume only 28 feet per horse-power per hour in small machines, and in large sizes as low 23.75 feet; so that 21.2 cubic feet of gas per hour will run an incandescent lamp of 16 candle-power, and this proportion is said to have been reduced in large plants which employ motors of 500 horse-power and more to 17.6 cubic feet of gas per horse-power per hour.

How economical such a motive power must be for all the smaller forms of manufacture, and especially for electrical lighting by isolated plants, will be apparent from the following tabular statement of the price per 1,000 cubic feet of gas which prevails at present in the principal cities of Germany:

Cities.	Price.
Altona, Bremen, and Mayence	$1.36
Crefeld (with discount to large consumers)	1.32
Brunswick, Bonn and Strasburg (without discount)	1.21
Magdeburg, Leipsic, and Breslau (with discount)	1.21
Barmen (with discount)	1.19
Dantzic and Dresden	1.14
Berlin and Königsberg (without discount)	1.09
Cassel, Dortmund, Elberfeld and Hanover (with discount)	1.09
Frankfort (with discount)	1.07
Stettin, Essen and Cologne	1.02
Bochum	.95

In some of the above named cities gas is made and furnished by the municipality; in others, by private companies chartered and managed similarly to private gas companies in the United States. In Frankfort the field is occupied by two companies—one English, the other German—which have parallel mains on all principal streets and supply for the above stated price, gas of uniformly excellent quality. When it is remembered that the coal for the manufacture of gas in this city is brought from England and the Ruhr district of Westphalia, it will be apparent that for two rival companies to prosper in a city of 180,000 inhabitants by selling gas at $1.07 per thousand it must require good management and the employment of the most improved methods. As a matter of fact, the cheapness of gas here, as elsewhere in Germany, is the direct result of the skill and care with which all the subsidiery products of coal distillation—tar, ammonia, etc.—are saved and utilized.

Lines of Magnetic Force Around a Straight Conductor—A Reply.

TO THE EDITOR OF ELECTRICAL REVIEW:

In regard to the communication of "F. H. L." in your issue of October 28, let me say that if a conductor be straight the lines of magnetic force due to a current of electricity flowing in it are circles whose planes are at right angles to the conductor, and whose centers lie in the conductor. The intensity of the magnetic force, at any point, varies inversely as the distance of the point from the conductor, and not inversely as the *square* of that distance as I understand "F. H. L." to say. Consider two points whose distances are r and r from the conductor, and let F and F be the intensity of the magnetic force at these points, respectively. The *circumferences* of the two circles passing through r and r, are $2\pi r$ and $2\pi r$, and if the force F moves a unit magnetic poll around the conductor along the circumference $2\pi r$ it will do a quantity of work equal to $F + 2\pi r$, and the force F will do work equal to $F + 2\pi r$, by moving a unit poll around the circumference $2\pi r$. As stated above, $F : F = \frac{1}{r} : \frac{1}{r}$ or $F : F = r : r$; therefore, $Fr = Fr$, and hence, $F + 2\pi r = F + 2\pi r$, or the two quantities of work are equal.

S. T. MORELAND.

Lexington, Va.

LITERARY.

"Standard Tables for Electric Wiremen, with Instructions for Wiremen and Linemen, Underwriters' Rules and Useful Formulas and Data." By Charles M. Davis. Fourth edition, thoroughly revised and edited by W. D. Weaver. Flexible morocco, 128 pages. Price, $1. Sent postpaid, on receipt of price, by ELECTRICAL REVIEW, 13 Park Row, New York.

The third edition of this popular work was exhausted within a few months after its issue, and the fourth edition has been delayed in order that it might contain the latest revisions of the insurance rules of the Underwriters' International Electric Association, now almost exclusively used in the United States. In addition to the above rules, there has been added to this edition an important section on the calculation of alternating current wiring which, for the first time, brings this subject within the reach of practical men. A number of the most important tables were prepared expressly for this work, and, being copyrighted, cannot be found elsewhere. Among these are the tables of alternating current wiring co-efficients, those on limiting currents for exterior wiring and on the candle-power of arc lamps, and the table enabling the ones for the three-standard lamp voltages to be used for any voltage or drop, as well as several others, including a complete set of wiring tables calculated on a uniform basis of 55 watt lamps. The method of determining the sizes of conductors for incandescent wiring, enables feeders, mains and branches to be proportioned as nearly exact as desired, instead of only approximated as by other methods. The wiring formulas for motor circuits, etc., are put in a simple and most practical form so as to be easily applied by anyone. The formulas for horse-power of engines and boilers are published here for the first time, and while they are based on rational principles, the different values of heating surfaces in boilers being considered, the results they give are the actual commercial ratings and not the theoretical horse-power.

Buffalo Electrical Society.

The annual meeting of the Buffalo Electrical Society was held recently in its rooms in the Library Building. Treasurer Samuel Stewart presented a report of the finances of the society, showing a balance on hand of $152.88; and librarian McNerny's report showed the library to contain 75 copies of standard electrical works, 66 volumes of electrical periodicals bound, and a large quantity of experimental apparatus. President Kitton congratulated the society on its condition, and pointed with pride to the fact that it had just entered on the eleventh year of its existence, it having been organized in the house of the present secretary, A. C. Terry, on September 11, 1883.

These officers were elected for the ensuing year: President, Philip K. Stern; vice-president, Frank C. Perkins; secretary, Astley C. Terry; treasurer, Samuel Stewart; and librarian, John G. McNerny; executive committee, Frank Kitton, George A. Burnett, C. V. Boughton.

At the next meeting, on November 16, President Stern will read a paper on "Electricity at the World's Fair."

A Model Switch Board.

The W. S. Hill Electric Company, of Boston, Mass., are rapidly coming to the front as manufacturers of high-grade switches and switch boards, and are establishing a reputation for excellence in this line of work which is bringing its own reward.

In a number of instances where specially fine work was required and original ideas necessary to carry out the plans, they demonstrated so thoroughly their ability to handle it in a satisfactory manner, that it has led to their receiving some of the largest orders ever placed in this country; and, notwithstanding the general depression of the last few months, their plant has been pushed to its utmost capacity, night work at times becoming a necessity.

Our illustration, which shows a 50 circuit arc switch board, recently constucted for the Narragansett Electric Lighting Company, of Providence, R. I., will give an idea of the class of work turned out by the W. S. Hill Company, every detail of which receives careful attention.

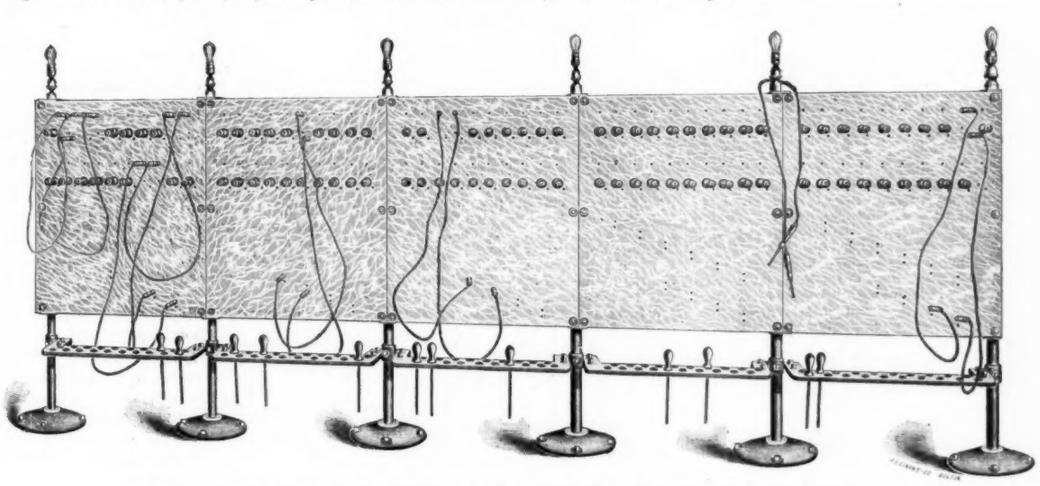
One of the prominent features of the arc switch board is that all working and contact parts are blind fastened to the back of the boards in the most rigid manner, avoiding the necessity of having bolts passing through and doing away with all metal on the face of it, which is both unsightly and dangerous to the operator.

Among recent orders for switch boards shipped by the W. S. Hill Company was one of 24 circuits, similar to the one illustrated, for the Lynn Gas and Electric Company, of Lynn, Mass., and one for the Philadelphia Traction Company, aggregating over three and one-half tons in weight, and comprising switches of from 1,000 to 4,000 amperes capacity.

They have a number of others under way, among them an eight panel alternating switch board to take care of six 7,000 light machines.

Their excellent facilities and large stock of finished parts of all kinds, ready for assembling at a moment's notice, place them in a position to fill orders promptly in this line, which they have made the leading feature of their business.

In addition to their main office and works at 133 Oliver street, Boston, the company is represented in New York by the Elson & Brewster Engineering Company at 122 Liberty street.



A MODEL SWITCH BOARD CONSTRUCTED BY THE W. S. HILL ELECTRIC COMPANY, BOSTON.

We Know of None. Who Knows?

TO THE EDITOR OF ELECTRICAL REVIEW:

Will you inform me through your paper, or otherwise, if there has been an electric tricycle or an electric carriage invented that is practical, and, if so, where I can write to find out about it? and oblige, yours truly,

S. C. CLATUR, 654 North Main street.

Manchester, N. H., November 2.

Mr. E. A. Leslie, general manager of the Manhattan Electric Light Company, of New York, is an ardent whist player, and is one of the contestants in the annual whist tourney now taking place at the Aurora Grata Club, Brooklyn.

The Primary Action of the Galvanic Current.

IT INCREASES THE AMOUNT OF OZONE IN THE BLOOD AS SHOWN BY CHEMICAL TEST OF THE BLOOD IN THE ARTERIES—WITH A THEORY OF ANIMAL ELECTRICITY.

BY J. MOUNT BLEYER, M. D., AND M. MILTON WEILL, M. D., OF NEW YORK CITY.

[From the archives of the Smithsonian Institution.]

Schönbein, in drawing his conclusions regarding the nature of ozone, assumed that oxygen was capable of three distinct conditions, viz.: Ozone, electro-negative, antozone, electro-positive and neutral oxygen, which, as its name indicates, has no polar distinction, but could be polarized and depolarized at will.

Of these three so-called forms of oxygen, the investigations of the observers since the day of the great Basle chemist have much changed our views. To-day we admit the existence of only two forms of oxygen—ozone and neutral oxygen, and for the sake of elucidation we give you the graphic construction of the molecule as we believe it to be:

$\overset{-}{\circ}\ \overset{+}{\circ}\ \overset{-}{\circ}$ = Ozone.

$\overset{-}{\circ}\ \overset{+}{\circ}$ = Neutral oxygen.

Assuming as he and the aftercoming observers did, that oxygen in its free state was neutral, and it so proved to be, he reasoned, and it is within the pale of all researches, even up to our own time, that as soon, or rather as we have found it, just before this oxygen enters into combination with either organic or inorganic substances in the presence of moisture, it becomes polarized.

Carrying these conclusions into the field of physiological chemistry, he became convinced that the corpuscles, like phosphorus, were possessed of the power of polarizing the oxygen in the lungs, and further of splitting up the molecules and re-arranging them in the form of ozone. His idea was that ozone existed in the blood, that it was the vital oxidizing agent by means of which the recuperative changes in the tissues were wrought, yet the years of careful work he devoted to searching, failed him in finding the slightest trace of ozone in the blood.

In his later years he became equally emphatic in his assertion that the resolution of ozone—its oxidation was so rapid that in the blood and the moistened tissues surrounding the capillaries where the real respiration is accomplished, it would be next nigh impossible to chemically detect the presence of ozone by the most delicate test. He even went so far as to doubt its existence in the blood, that is to say, he believed that it was ushered into existence and was used up in performing its function so quickly that it was not possible to chemically isolate it, that in the blood of the capillaries—presumably the radicals, although he does not so put it—where the pressure conditions are such as to allow of the free interchange of the gases of the blood with the tissue elements, ozone no longer existed.

Like many other great minds, Schönbein was right in many of his claims, but in many other of his theories he allowed himself to fall into error, for in justice to those who come after him to study this question of the physiological significance of ozone, and with no discredit to his greatness, Schönbein left much to be cleared up and explained. The ever changing and improving chemical facilities and knowledge make this task far more easy. With the advantages afforded by the chemistry of his day, Schönbein accomplished an Herculean task. That famous physiologist, His, who had grown up in shadows of Schönbein laboratory and influence also failed to discover ozone in the blood.

At the very time His was engaged in his futile efforts, Alexander Schmitt was at work upon the same question—ozone in the blood.

We need not rehearse the details of Schmitt's methods; suffice it to say his experiments were elaborate and carefully made, and showed beyond doubt that ozone existed in the blood; but the quantity, apparently, was very small.

Not long afterwards Kühne, improving on Schmitt's tests, proved that ozone existed in the blood in readily appreciable quantity, and the question was forever settled in the affirmative.

Kühne concluded, and his deductions were not far from approximating the truth, that the red corpuscles greedily absorb ozone under the natural formation of carbonic acid, and decompose water as free oxygen is liberated.

Our experiments on the blood with the galvanic current are in a line with those of Kühne and Schmitt, only a short step in advance of those observers, a mere completion of their unfinished tasks. Whatever value the results we have obtained may have, there can be no doubt that the galvanic current applied to the living body, whatever else its action may be, increases the amount of ozone both in the corpuscle and the plasma.

Before entering into a rehearsal of the details of our experiments, let us briefly touch upon the physiology of the blood and the functions of its gases; for here it was that we suspected the seat of first physiological action of the galvanic current, and here, too, we were led to trace to its source, animal electricity, and observe its function, as we suppose it, in the human economy.

THE BLOOD—ITS GASES AND SOLIDS.

The gases in the blood, the carbonic acid, the nitrogen and the oxygen, which interests us in particular, need not be gone into at length.

The oxygen in the blood exists in two forms. First, that which is held in solution by the plasma, and second, that which enters into combination with the constituent elements of the corpuscle.

The first variety commands our attention, for the reason that to all appearances the galvanic current first acts upon this freely dissolved oxygen, and which naturally, therefore, first undergoes the transforming change from O_2 into O_3.

With a single exception, that of defibrinated blood, the blood obeys Dalton's well-known law of the absorption of gases by liquids. In vacuum, 100 volumes of blood give up a trifle over 72 volumes of gas, of which in arterial blood, 20 volumes, upon analysis, consist of oxygen, while in venous blood the volume is reduced to between eight or ten.

The plasma simply holds the oxygen in solution, while the haemoglobin, which, by actual weight, makes up 90 per cent. of the dried corpuscle, enters into partial combination with the oxygen, although we have observed—and the observations are in keeping with those of other observers—that the oxygen in the haemoglobin is in such a loosely-combined state that it readily solves its bonds of union, and under the slightest provocation goes over to the other elements for which it has affinity as soon as the pressure conditions of the plasma are changed so as to permit of a loosening of its bonds.

Plasma, or to be more accurate, fresh serum, will, upon exposure to the air, absorb no more gas than ordinary water under similar conditions, some three volumes; defibrinated or whipped blood, however, contrary to what might be expected, takes up considerably more. This will suffice for the behavior of the gases of the blood. Now a word about its solid constituents.

In general, in the plasma they are serum, albumen, globulin and crystallizable fatty and nitrogenous matter which, as we shall endeavor to show, are rendered more diffusible by this very transformation of oxygen into ozone, caused by the polarizing action of the existing animal electricity of the body, and rendered even more diffusible by the action of the galvanic current.

In the larger vessels, for example, the carotid artery which we have chosen as the seat of our experimentation, not only because it is accessible and convenient, but rather because it is a direct branch of the aorta where both the plasma and corpuscles are equipped with all the oxygen they can carry, the blood is charged to its full capacity with those elements which it is commissioned to give up to, and upon which the tissues depend, particularly oxygen.

All physiologists agree that in these large vessels carrying arterial blood, the haemoglobin in the corpuscle is in the form of oxy-haemoglobin, which signifies simply that the haemoglobin has entered into partial combination with as much oxygen as it can hold, and that it is ready to transfer this oxygen to the tissues as soon as the oxygen of the plasma has become exhausted, and the pressure conditions become so reduced as to permit the giving up of the gas.

This occurs in the capillaries. Until these are reached the pressure of the oxygen in the plasma restrains the haemoglobin from giving its oxygen. Here in the liquid moistening the febrillæ of muscle that surround the terminal capillaries, where the transfer of oxygen in reality begins, the tension of the oxygen is almost nil, since the tissue elements are steadily taking up the gas from the lymph surrounding them, and the plasma contiues to give up oxygen through the walls of the capillaries until the tension falls too low for it to longer do so; then it is that a portion of the oxygen of the haemoglobin is freed, and is dissolved in the plasma to take the place of that oxygen which it has given up, and which in turn has passed out into the lymph on the other side of the capillary wall. This interchange continues until the pressure of the oxygen in the lymph equals that of the oxygen in the plasma, by which time the venous system of capillaries, the return circulation, has been reached.

One of the strong indications of the action of the galvanic current on the blood is the probability that it facilitates this transfer of oxygen to the tissues in active form, both chemically and physically. By re-arranging the atoms of some of the molecules of oxygen in the plasma, the volume of the oxygen held in solution is reduced, and the oxygen of the haemoglobin is at once transferred to the plasma instead of being doled out, as it were, to suit the constantly varying pressure changes that go on as the blood completes its circulatory round. This being the case, the transforming process is undoubtedly ushered into existence through the polarizing property of the animal electricity, of which we shall speak further on.

How far chemical change is wrought upon the diffusible solids of the blood by the generation and presence of such an increased amount of ozone, we are unable to make precise answer, and we leave it to the thoughtful investigation of those observers who may take interest in our work and who are blessed with a more acute knowledge of physiological chemistry and a more completely equipped laboratory than it is our good fortune to possess. To our mind there seems little question of the occurrence of just such a change as we have described. Our analyses thus far have remained within the sphere of quality; it remains for others to continue in the more exact line of quantity. Reasoning by analogy, the galvanic current acts precisely upon the oxygen in solution in the plasma as it did in the jar filled with O_2 through which Schönbein passed the current and observed its transformation into ozone.

There is but one possible action of the ozone on the blood. It must hurry on the transfer of the oxygen to the tissues, call into existence the oxidation of those constructive elements which the tissues require for their revivification. Doubtless, these changes are more extensive than we have been able to determine.

OTHER FACTORS TO BE CONSIDERED.

The experiments of Guy-Lassan should teach us a valuable physiological lesson. From his laboratory we feel that we can carry them over to that storehouse of chemical energy—the human body; and observe changes corresponding to those he observed in his jars filled with gases possessed of great affinity for one another which, however, remained quiescent and inactive until he prodded them with the stimulus of a galvanic current, which, as it passed through the gases, spurred into action, or awakened, as it were, their slumbering affinities, polarized their molecules and ushered into life the new something, the result of the three great potent factors—polarization, chemical action and affinity. We have tried to impress upon you the importance of these three conditions, for upon them depend all the chemico-physiological changes—in short, all changes that go on within the human body.

We have observed them time and again in the course of our experimenting, and we have subjected them singly and together to the most rigorous test of verification.

Our observations point to the one conclusion, and that is, that chemical action, the feeder of life, cannot go on unless there is present an electrical force, an energy that can polarize the molecules of the combining elements and prepare them for combining action. Affinity, catalytic force, the phenomena of contact in themselves, are impotent without that ever preceding factor—molecular polarization.

It is the metabolism, the anabolism, the katabolism, the all, and more were it possible, of that cardinal nourisher of tissues, that feeder of life, the blood.

Animal electricity, and the important part it plays, we will reserve for a later chapter, and pass over to general details of our experiments upon the blood of the living animal in its normal state and under the stimulus of the galvanic current.

(To be continued.)

Commercial Electric Engineering Company.

Articles of association of the Commercial Electric Engineering Company, of Detroit, Mich., have been filed, the authorized capital being $50,000, $16,250 of which has been paid in. The business of the company will be that of electric engineering and construction and general electric supplies. The company has opened temporary offices at 47 and 51 Hodges' block, Detroit, and have already secured several contracts for central station lighting plants. The company will represent the Standard system of arc lighting in Michigan, Ohio and Indiana, and is under the management of G. E. Fisher, formerly with the Commercial Electric Company, of Detroit.

New York Subway Commissioners.

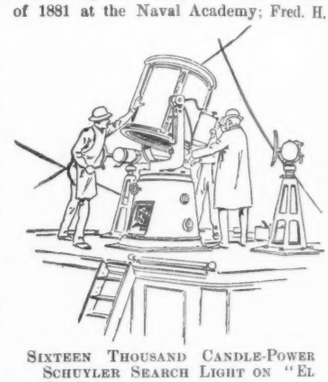
Mayor Gilroy reappointed, on November 8, the three members of the New York Board of Electrical Control, Theodore Moss, Jacob Hess and Walton Storm. They are appointed for one year from November 1, 1893. The salary of the office is $5,000 a year. Moss and Storm are democrats, and Hess is a republican.

Electrical Men as Officers on "El Cid."

"El Cid," the big ocean steamship purchased by C. R. Flint & Company, of New York, for the Brazilian Navy, has practically completed her metamorphosis and is now a man-o'-war which is expected to make things interesting for the rebel, Admiral Mello. She is equipped with a 43 ton dynamite gun and other smaller guns. Next to the dynamite gun a big electric search light attracts the most attention. It is mounted on what in an ordinary boat would be the pilot-house, and has a brace of Gatling guns flanking it, one on each side. It is of 16,000 candle-power, and is one of the largest ever manufactured by the Schuyler Electric Company, of Middletown, Conn. It was recently on exhibition at the World's Fair in Chicago, and was purchased there by Admiral Maurity on his recent flying trip to the West. The Brazilians have purchased still another of about the same power and of the same make, which will be delivered on board "E. Cid" some day this week.

The electric search light is evidently an object of pride to Capt. Baker, who will command "El Cid." He refers to it in his quiet way as a pretty good thing in the way of a light. He stood close by the breech of the big dynamite gun as he spoke and beamed alternately upon one and then upon the other.

Among the other officers of "El Cid" are several Naval Academy men who are well-known in the electrical field. They are: Macdonough Craven, graduate of the class of 1881 at the Naval Academy; Fred. H. Sparling and John J. Conway, graduates of the class of 1882; and Edward Brinley, graduate of the class of 1880.



SIXTEEN THOUSAND CANDLE-POWER SCHUYLER SEARCH LIGHT ON "EL CID."

Craven is the son of Admiral T. T. Craven, who commanded the Brooklyn under Admiral Farragut. Admiral Craven was one of the best fighters and perhaps the best seaman of his day. Young Craven stood at the head of his class at Annapolis in seamanship. He was considered the best all-round practical man of his class. He resigned from the service to go into civil engineering. He was the assistant engineer in charge of the construction of the Niagara Falls power tunnel, and is at present in charge of the construction of the great Quaker Bridge dam at Croton Landing. He hails from Geneva, N. Y.

Sparling is from the State of Washington He ran away and went to sea when a boy, and his family sought to gratify his nautical tastes by having him appointed to Annapolis. When he entered the academy he had been several years at sea, and was a good practical seaman. He resigned from the service to enter the Chinese navy during the war between China and France over Tonquin, but arrived in China too late. He later commanded a steamship trading between Seattle and San Francisco. Her machinery became disabled in a gale of wind, and she went on a lee shore and was lost. He is now head of the firm of F. H. Sparling & Company, dealers in wire rope, at 44 Broadway. Sparling was at one time connected with W. H. Gordon & Company, electric supply dealers, of New York, and later he traveled for the John A. Roebling's Sons' Company.

Conway is a member of the firm of F. H. Sparling & Company, and is from Norwich, N. Y.

Brinley resigned from the service to enter the cotton business in the South. Later he came to this city, and now has an office in Wall street.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

Electric Light and Power.

ATCHISON, KAN.—The Atchison Railway and Electric Light Company filed notice of an increase of capital from $250,000 to $300,000.

SIDNEY, OHIO.—The Sidney Electric Light Company have increased their capital stock from $15,000 to $25,000.

JONESVILLE, MICH.—Jonesville Electric Light and Power Company. Capital, $15,000.

DETROIT, MICH.—Michigan Electric Company, Detroit, Mich. Capital, $10,000.

DENVER, COLO.—The Victor Electric Light, Power and Water Company has filed articles of incorporation. It is capitalized at $100,000 and will supply the towns of Victor, Barry, Lawrence and Fremont with electric lights and a water plant. The incorporators are W. K. Johnson, H. E. Woods and J. E. Rockwell.

CRIPPLE CREEK, COLO.—The Cripple Creek Electric Light Company has been incorporated with a capital of $100,000. The directors are Robert P. Davis, Hiram Wilson and Willis S. Montgomery.

NEW YORK, N. Y.—The Cataract General Electric Company has been incorporated for the purpose of purchasing and selling electric power, and the negotiations of contracts for the production, distribution and use of such power within the county of Monroe, and in such other places on or near the lines of railroad entering the county as may furnish a market for such power. The principal office will be in New York city and the capital is $8,000, divided into $10 shares. The directors are: William Mertens, Thomas C. Platt, Commodore P. Vedder, Frank W. Hawley, and Charlton T. Lewis of New York city, the last three named each subscribing for 50 shares of the capital stock.

FLINT, MICH.—The New Home Telephone Company has filed articles of association with the county clerk. The capital stock is $120,000.

SOMERSET, PA.—The Somerset County Telephone Company: capital, $6,000. Directors, W. S. Mack, W. W. Staub, Meyersdale; G. B. Houck, E. H. Werner, J. A. Berkey, Somerset.

CHICAGO, ILL.—Articles of incorporation were filed with the Secretary of State yesterday of the Northwestern Elevated Railroad Company, which proposes to construct a railroad on certain streets in Chicago. The capital stock is $15,000,000 and the incorporators are Chicago capitalists.

PITTSBURGH, PA.—The Pittsburgh Electric Company, capital, $5,000. Directors, James A. Curry, Wilkinsburg; William H. Warwick, Bellvue; Robert A. Johnston, William N. Gillespie, Pittsburgh; Edwin L. Allen, Allegheny.

NIAGARA FALLS, N. Y.—The Pittsburgh Reduction Company has made arrangements for the construction of its immense aluminum plant. It is the first to lease electric power. The buildings will be three in number.

The Expiration of Edison's English Filament Patent.

On November 10, 1893, the English patent for the original Edison incandescent lamp expired. Being the first of the family it was expected that a great show of pomp might attend the funeral obsequies, but all was quiet, and not a ripple ruffled the present calmness which surrounds the present injunction suits.

The English patent was entered on November 10, 1879, but was not sealed until May of the following year. The life of a British patent is 14 years from the date of the application. As, however, it is claimed that the English patent was taken out after the United States patent, Mr. Fish, the counsel for the General Electric Company, declares that, as far as he knows, the expiration of this patent will have absolutely no effect on the life of the United States patent.

As it has been rumored that there is a possibility of one or more of the lamp companies now closed by injunctions, making application for a removal of the injunctions on the grounds that the Edison patent has expired in this country, it might be interesting to determine upon what facts the companies would base their application.

Attached to the original Edison patent, dated January 27, 1880, is the following correction which is here given in full:

CORRECTION IN LETTERS PATENT NO. 225,898.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., December 18, 1883.

In compliance with the request of the party in interest, Letters Patent No. 223,898, granted January 27, 1880, to Thomas A. Edison, of Menlo Park, New Jersey, for an improvement in "electric lamps," is hereby limited so as to expire at the same time with the patent of the following named having the shortest time to run, viz., British patent, dated November 10, 1879, No. 4,576; Canadian patent, dated November 17, 1879, No. 10,654; Belgian patent, dated November 29, 1879, No. 49,884; Italian patent, dated December 6, 1879, and French patent, dated January 20, 1880, No. 133,756.

It is hereby certified that the proper entries and corrections have been made in the files and records of the Patent Office.

This amendment is made that the United States patent may conform to the provisions of Section 4,887 of the Revised Statutes.

BENJ. BUTTERWORTH,
Commissioner of Patents.

Approved:
M. L. JOSLYN.
Acting Secretary of the Interior.

If we may take a little hint from the above request, it would seem that since it was made with some object in view, that object must have been something which would have shortened the life of the United States patent. Such an unusual request as asking for a limitation of a patent as valuable as this one promised to be, must have been caused by a circumstance which was very dangerous at the time. However, now that the danger has past and the English patent has expired according to the request of the parties in interest, the expiration of the United States patent should have been on November 10 of this year. But whether the Commissioner of Patents has any right to limit or extend a patent beyond its natural life, as affected by existing conditions, such as the expiration of foreign patents or other attending circumstances, is quite another question. Lawyers, other than those connected with the parties in interest, declare that the correction to the original patent is not worth the paper it is printed on. It would, therefore, seem that the expiration of the English patent is merely a passing incident, and that on November 17, 1894, when the Canadian patent expires, we may expect a little more litigation. At the present time no certainty exists. The appeal from the Oconto lamp case is soon to be decided, and, as a prominent patent lawyer remarked in connection with this case, "A Court of Appeals has its uses, and once in awhile a decision is reversed."

The Edson Pressure Recording Gauge.

A steadily increasing business with electric light and power companies in this country, Canada and abroad, is reported by Mr. Jarvis B. Edson, of 87 Liberty street, New York, N. Y., the sole manufacturer of the Edson pressure recording gauge.

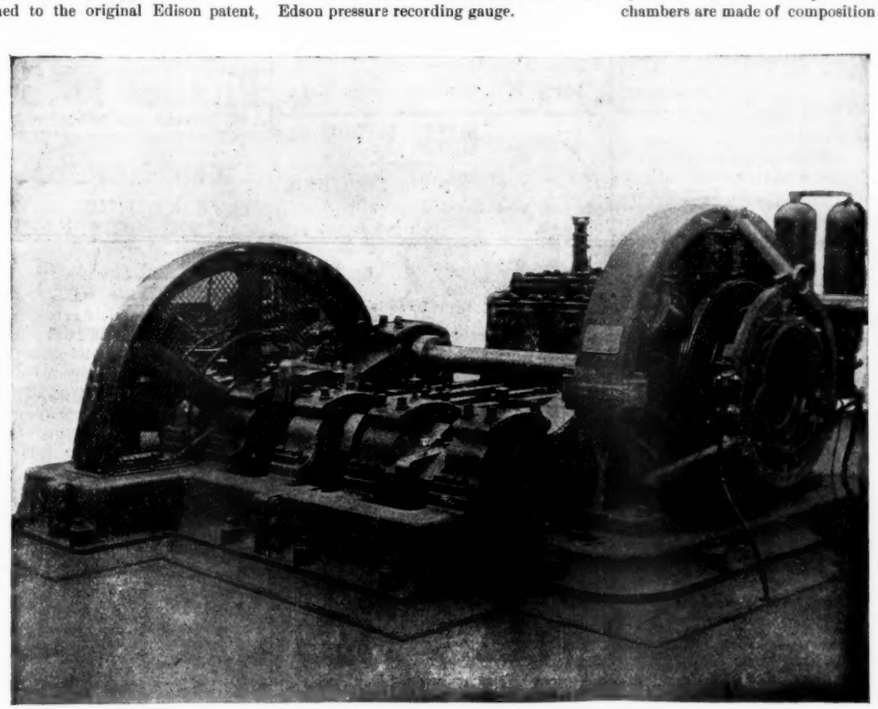
From the universal adoption of these very valuable instruments in all classes of manufacturing industry, and especially in electric light and power plants in all parts of the world, which have been the only recognized standard in their particular line for the last 20 years, it would seem that there is a great amount of truth in the editorial remark recently made by a leading engineering journal, viz., "It is one of the essentials that often saves enough to pay the dividend." Certainly this editorial comment is carried out by the letters he has received and is receiving from time to time from his patrons, of whom there are many thousands scattered all over the world.

The Edson pressure recording and alarm gauge gives a record of the steam, air, gas, water or oil pressure carried for the 24 hours, and each hour is printed on the chart, which is ruled to the special vertical scale of the instrument. The portion of chart traced upon is removed daily and placed in a chart album specially provided therefor. In this way a company keeps a ledger account of their steam boiler. This chart album is very useful for reference. The leading engineers have for many years made a practice of embracing the Edson recorder in their specifications, as they claim it is an essential feature of a modern and complete steam plant, both from a monitorial as well as an economical standpoint, and that it soon pays for itself in fuel saved. Also, that a superintendent or manager cannot conservatively manage his steam plant without the information obtained by the Edson pressure recording gauge.

A Large Mine Pump.

The application of electricity to mine service, although but one of the later departures in the field, has already attained that degree of perfection which allows it to become an unrivaled competitor to both steam and compressed air. This fact was no where so ably demonstrated as at the recent World's Fair in the apparatus of the General Electric Company, which made a complete exhibit of mining electrical machinery.

The largest and most striking piece of machinery in this mining exhibit was a single reduction electric pump employed to furnish a head of water to the Pelton wheel in the ingenious demonstration of transmission of power by three phase current. This pump is triplex double acting, having outside packed plungers, operated by means of crossheads and connecting rods, from an extra heavy forged steel crank shaft. It was designed for mine work, and has a capacity of 500 gallons per minute against 650 foot head. The plungers are of bronze, have a diameter of five and three eighth inches, and are 18 inch stroke, and when operating at full capacity require 50 revolutions of the crank shaft per minute, giving a plunger speed of 150 feet. The cylinders and valve chambers are made of composition metal in order to resist the action of bad mine water. The pump is operated through a single set of gears by a General Electric six-pole 75 kilowatt motor, making 275 revolutions per minute. This necessitates a reduction of only five to one at the gears. The design of the pump is, in many respects, novel. The arrangement of the armature shaft, which is prolonged over the top of the pump, brings the motor to one side of the pump instead of in front, as is usually the case. By this means a great saving in space is effected, and this fact is a matter of considerable importance when it is a question of installing pumps in the underground recesses of mines. Hitherto, pumps of this class have always been constructed with two sets of gears, but in this pump one set is economized by the slow speed of the motor, and a proportionate gain in efficiency effected. The pump throughout is solidly, substantially and extra heavily constructed, and may be run for long periods without cessation at its full rated capacity. An electric pump of similar capacity to this has been, for sometime past, operating successfully in the Calumet and Hecla mine.



A LARGE ELECTRIC MINE PUMP INSTALLED BY THE GENERAL ELECTRIC COMPANY.

It is reported that the Commercial Cable Company will begin work on their third cable early next year. Mr. Mackay is furnishing a large portion of the money required for this purpose.

KINDRED INTERESTS

George Cutter, Chicago, reports a good outlook for the Waterhouse incandescent arc lamps, which are taking well in the West.

The Metropolitan Electric Company, Chicago, reports the receipt of a very important order for N. I. R. wire. This wire is coming into favor very rapidly, contractors and builders finding that it meets every requirement. The Metropolitan Company carries a large stock of all sizes, and is enabled to fill orders promptly.

The Central Electric Company, Chicago, state that they have been receiving large orders for all sizes of porcelain insulators, and are making a specialty of this particular line of goods. They claim to be handling the highest grade of porcelain ware, and the numerous large orders which they have recently booked will more than confirm their statement. There have been so many cheap shoddy porcelain insulators foisted upon the market that it will no doubt be of interest to the trade to know that a highly vitrified and water-proof insulator can be secured without delay.

Receiver for the Shaver Corporation.

Theron G. Strong has been appointed receiver of the property of the Shaver Corporation by Judge Lacombe in the United States Circuit Court. The application was made by William L. Brown, who asserts that the concern owes him $23,000, which it is unable to pay. It also owes other sums to the amount of $4,000. The corporation was organized in Virginia in 1892 with a capital stock of $2,000,000. Its principal offices are in this city, and its business is dealing in patents. It owns the Shaver telephone, which an injunction prevents it from selling. The bill in equity states that the assets consist of $4,000 worth of stock, $6,200 worth in sub-companies, and the patent rights, many of which are insecure. The application for a receiver was concurred in by the officers.

ELECTRIC RAILWAY AND POWER NOTES.

Van Wert, O., people will try electricity for cooking purposes.

The United States Navy Department has sent us the "Annual Report of the Chief of the Bureau of Steam Engineering" for 1893.

Contracts for 95,000 feet of cable for the trolley line on Tenth and Eleventh streets, in Philadelphia, have been awarded by the Electric Traction Company.

The contract for the building of an electric street railway in Tarentum, Pa., was let to a Pittsburgh firm last week. The work will be commenced at once, and cars are to be running within 45 days.

The Dixwell avenue horse railroad in New Haven, Conn., has been bought by a Philadelphia syndicate for $250,000, and will be extended to Centerville and equipped with electricity. The heaviest stockholders in the syndicate are Richard H. Clay, president of the Security Trust Company, of Philadelphia, and Edward W. Moore, president of the passenger railway in Newark, N. J.

The contract for excavation and the construction of foundations for the three large buildings to compose the new plant of the Pittsburgh Reduction Company, at Niagara Falls, was awarded on November 3 to James Stewart & Company, who are building the power house for the Cataract Construction Company. The work on these new buildings will begin on Monday, when a large force of men will be put to work. They are to be of stone and steel, and will cover a good deal of ground. They are to be completed by February 1, and the Niagara Falls Power Company will furnish the electrical power for them.

Mistakes in Delivering a Telegram.

The Supreme Court, of Georgia, held, in the case of the Western Union Telegraph Company *vs.* Patrick, that where the sender of a telegraphic message had erroneously given the address of the sendee as a particular street number in a city, and the telegraph company had promptly carried the message to that number and was unable to deliver it because the sendee was not to be found there, the sender was not entitled to recover of the company the penalty prescribed by the Georgia act of 1887, unless it affirmatively appeared that the company knew the proper address of the sendee or could have readily ascertained the same. If upon examination of the city directory the initials of the sendee's given name as contained in the message were not to be found, the court said the company would not, in order to escape the penalty, be bound to send the message to a person whose surname in the directory was the same as that of the sendee, although in point of fact this person was really the sendee, whose given name, as set out in the directory, corresponded to one of the initials in the address, the other initial appearing in the directory.

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COLUMBUS, IND., September 8, 1893.

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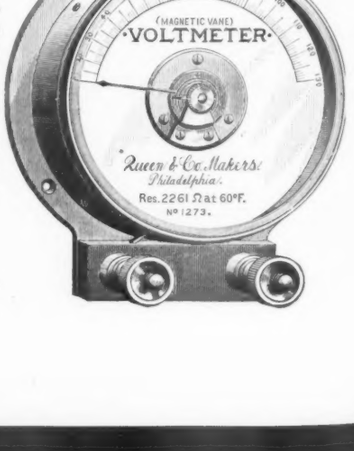

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